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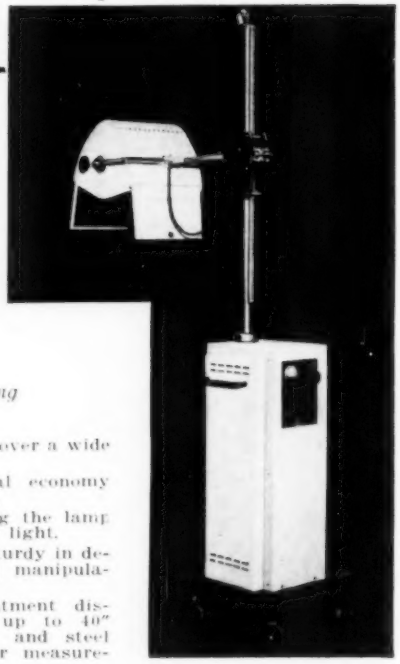

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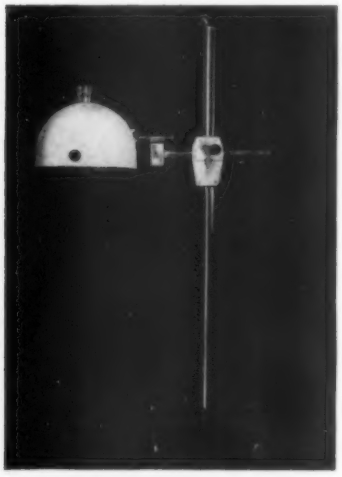

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FANGO TREATMENT OF ARTHRITIS *

EMIL VRTIAK, M.D.,
SIMON BENSON, Ph.D.,
DISRAELI KOBAK, M.D.,
AND
ANTON J. CARLSON, Ph.D., M.D.
CHICAGO

Mud of variable moisture, consistency and temperature has been employed empirically for many centuries in the treatment of a number of inflammatory and exudative processes. The antiquity of this practice is evidenced by the historic fact that many of the ancient Roman physicians ordered suitable cases to take treatments at what is today known as Battaglia, where several Roman emperors had erected magnificent bath houses. Other peoples, too, made extensive use of local and general mud baths. To this very day the European institutions afford thousands of rheumatic patients an opportunity to benefit from the use of their native moors at their natural sources.

Of the moors that today enjoy widespread acceptance as the best and most effective kind is that obtained from the volcanic lakes at Battaglia in northern Italy. It is now marketed as Fango di Battaglia and obtainable in any desired quantity for application even at the patient's bedside, so that whatever benefit can be derived by a sojourn at the Italian resort is available to any one, especially since the technic of its therapy is devoid of the complicated procedures associated with those commonly employed for similar conditions.

It is but recently that the literature of what has become known as pelotherapy contains data based on clinical studies under conditions which removed its evaluation from the domain of empiricism. Our study was undertaken for the purpose of determining the clinical value of fango in a condition for which its indication has been most frequently stressed — arthritis.

Chemical and Physical Properties

Many competent observers have asserted that Fango di Battaglia possesses chemical, physical and even radioactive properties superior to those moors that have been taken from other regions. It actually is a predominantly mineral mud, differing from the more common types that contain more vegetable than mineral matter. Its precise chemical composition is shown in the following analysis:

Water	3.64 per cent
Organic substances	6.43 per cent
Inorganic substances	89.93 per cent

The inorganic substances contain:

Carbon dioxide	11.75 per cent
Anhydrous sulphuric acid	0.65 per cent
Silicic anhydride	8.01 per cent
Phosphoric anhydride	0.21 per cent
Calcium oxide	12.04 per cent
Magnesium oxide	1.46 per cent
Oxide of iron	6.34 per cent
Oxide of aluminum	1.07 per cent

* Read at the Sixteenth Annual Session of the American Congress of Physical Therapy, Cincinnati, Ohio, September 22, 1937.

Oxide of porassium	0.33 per cent
Oxide of sodium	0.28 per cent
Manganese	trace
Sulphuretted hydrogen	trace
Volatile fatty acids	trace

The above analysis has been reported to the Imperial Academy of Sciences of Vienna by Professor Ludwig[1] and subsequently was confirmed by Strasser, Kisch and Sommer.[2] We may therefore accept that the substances which theoretically should prove of therapeutic value are carbonic acid, iron, calcium, sulphur and silica.

Of especial interest are the physical properties of fango which Singer[3] has given as: High specific gravity, low specific heat, low heat conductivity, homogeneous dispersion of particles, and high plasticity due to dispersion and colloids.

So far as the claims that fango possesses radioactive properties are concerned, we have been able to detect them to such a small extent as to be negligible from a purely therapeutic point of view. Of importance is the circumstance that fango in the marketed form is absolutely sterile, so that no fear of contamination need be had even in treating patients with open cutaneous lesions. This sterility is of course attributable to the intense heat of the volcanic lakes from which the fango is taken for export. It is at least questionable whether such sterility is assured with moors taken from natural sources in which the temperature is inadequate to destroy bacteria.

Effects and Indications

The literature is replete with theoretic assumptions concerning the mechanism of the effect of fango on the various diseases and conditions in which it has been used with a measure of success. It was natural that the established chemical composition and the minimal presence of radioactive substances should have misled certain clinicians into attributing to both a role in the therapeutic effect. With the simple technic to be described below it is apparent that so far as the given chemical constituents are concerned they cannot logically have any tangible or pronounced effect on the processes for which fango has been heretofore advocated. When it is considered that waters in spas contain similar chemical constituents and are either ingested or utilized in the form of baths for extended periods without established proof of a direct relation to whatever amelioration the patients have experienced, it becomes evident that the mere application of fango to an unbroken skin cannot cause absorption of any of the chemicals in a quantity sufficient to influence the organism to a considerable degree. Accordingly the beneficial effects obtained by fango treatment must be explained by properties other than those claimed.

It is reasonable to accept that the therapeutic effects are produced by a thermo-mechanical action which is approached but not reached by other similar measures. Thus it is known that since time immemorial warm cataplasms of substances devoid of minerals, for instance linseed poultices, have been used to relieve the tension resulting from infection. The difference, as already alluded to, is one in degree, a circumstance of great importance when one considers the graver pathologic types for which fango has been advocated. Not unlike other agents of a thermic nature fango produces a marked hyperemia of the skin, and enhances the circulatory current in the region to which it is applied. Lapore[4] has observed local vascular dilatation and increased diaphoresis. This observation is confirmed by special studies of Redaelli[5] who has shown that fango has a direct effect on the

capillary pressure by careful measurements made before, during and after treatment with the aid of capillaroscopy and Salvioli's tonometer. These studies demonstrated that fango reduces capillary pressure and enhances the circulation of the blood apart from the production of relatively deep vasodilatation. Anatomically it was shown that the vascular walls become more permeable.

To all this must be added the purely mechanical effect incident to the uniform pressure exerted by the plastic material which not only influences muscular spasm bythe heat but effects a degree of sedation on the cutaneous nerves. The low specific heat and heat conductivity of this material facilitate mild but prolonged heat effects which perhaps achieve slower but more lasting influences on the metabolism of inflamed parts. Accordingly by a variation of technic and appropriate dosage of temperature the clinician has in fango a medium which can be adjusted to both acute and chronic inflammatory and exudative processes under a regime which permits individualization.

Technic

It should be understood that while fango has been applied to virtually the entire body we shall restrict ourselves to a description of topical applications, such for example as around a joint and its immediate vicinity. The fango we have used is dry, much like a powder, and is first mixed with about 50 to 60 per cent water, i.e., to insure a homogeneous clay-like mixture suitable for poulticing. This mixture can be prepared in any desired double boiler of suitable size, the mixing being best accomplished by a wooden ladle. After the right consistency of the mass has been attained the water in the outer vessel is heated while the moist mass itself is being constantly stirred until it reaches approximately 180 F. From this heated material a sufficient quantity is removed to any desired vessel and cold dry fango is added by stirring until the mass is lowered to the desired temperature. It is advisable to begin treatments with a mixture at 108 F. and gradually to increase the temperature of the mass in subsequent treatments to about 125 F. The extremity or region to be treated is placed over two layers, the lower one being an ordinary woolen blanket, the upper and nearest the body of rubberized material, or of coarse linen or similar composition. The warm mass of fango is spread over the upper sheet at about an inch in thickness. On this is layed the affected part. More of this mud is applied to the exposed anterior part of the limb and the mass is firmly wrapped around the region or articulation. Between the fango sheet and the blanket some impermeable or water-proof linen may be interposed partly to insure cleanliness and partly to retain the heat and moisture. Finally the woolen blanket is wrapped around the patient to prevent chilling and conserve the temperature and moisture. The average length of treatment varies from one-half to one hour. At the conclusion of treatment the mass, which has meanwhile become somewhat thicker in consistency is easily removed, after which the part is cleansed with a warm bath, shower or sponge. Patients are advised to remain indoors for a short while as a preventive against chilling. So far as concerns the frequency of treatment this is determined by individual conditions. Limited regions or joints can be treated daily, while large parts or multiple joints are often progressing better when treatments are given on alternate days. The number of applications to be administered depends upon the response of each individual case. There are no contraindications to this method of treatment as such. The usual care is required in individuals with cardiac lesions, or conditions susceptible to the effects of intense and prolonged moist heat.

Clinical Impressions

Although the foreign literature contains many references to the application of fango in various rheumatic conditions, the authors restricted themselves to an investigation of its clinical effects on various types of arthritis. This work was undertaken experimentally without any preconceived notion but with especialy regard to comparison with the results obtained by other methods now in common use. Twenty-five unselected cases were given the fango treatment according to the technic described above. Table 1 shows the diagnoses and distribution in this group.

TABLE 1. — *Conditions Treated with Fango*

Diagnosis	No. Patients
Atrophic arthritis	15
Hypertrophic arthritis	5
Traumatic arthritis	1
Sciatica	3
Synovitis	1

The ages of these patients ranged from 20 to 74, sixteen (64 per cent) being between 40 and 60 years. The average weight in the atrophic arthritis group was 145, in the hypertrophic group 165, while the patients with sciatica averaged 150 lbs. Eleven patients had lost prior to treatment 12 to 80 lbs., an average weight loss of 30 lbs.

The average duration of the disabilities according to the histories given by the patients was approximately 4 years and 9 months, table 2 showing the variations according to the pathologic grouping.

TABLE 2. — *Average Duration of Disability Preceding Treatment*

Group	Number of Patients	Duration* in Years	Months
Atrophic arthritis	15	5	2
Hypertrophic arthritis	5	4	9
Sciatica	3	2	....
Traumatic arthritis	1	10	....
Synovitis	1	2	....
Total	25	23	11

* Average for the five groups: 4 years and 9 months.

It is evident from the above table that we are dealing with chronic processes of considerable duration, and as these patients had been given various methods of treatment it is also apparent that they had derived no benefit from the procedures common in practice.

Of the entire group 10 patients gave a history of an acute onset, while the remaining 15 claimed that their conditions developed slowly. Eight patients stated that there had been rheumatism in their families.

Seventeen patients presented evidence of focal infection or conditions likely to have a relation to their arthritic state, as is shown in table 3. Five patients were found to be allergic to head colds.

Effect on the Blood. — For external reasons it was possible to study the behavior of the blood in only 23 patients of our series. In each instance the number of erthrocytes and leukocytes, the percentage of hemoglobin and the sedimentation rate were investigated both prior to the institution of fango treatment and at its conclusion. Since nothing would be gained from a report on each individual finding it is deemed practical to present averages in the various groups (table 4).

TABLE 3 — *Focal Infections and Complications*

Diagnosis	Number of Patients
Tonsillitis, chronic	1
Tonsillitis, chronic and dental carics	1
Tonsillitis, chronic and constipation	2
Pharyngitis and constipation	1
Sinusitis	1
Sinusitis, nephritis, and constipation	1
Tonsillitis, hypertrophic and gonorrhea	1
Prostatitis, dental caries and constipation	1
Stricture, urethral	1
Ulcer, varicose	1
Psoriasis	1
Constipation	5
Total	17

TABLE 4. — *The Average Blood Count, Hemoglobin and Sedimentation Rate*

Group	Number of Patients	Red Cells — Before	Red Cells — After	White Cells — Before	White Cells — After	Hemoglobin % — B	Hemoglobin % — A	Sed. Rate 18 mm. — B	Sed. Rate 18 mm. — A
Atrophic Arthritis	(14)	4,370,000	4,300,000	9,270	8,810	78	77	:52	1:20
Hypertrophic	(4)	4,730,000	4,373,000	7,190	6,675	81	81	3:12	3:50
Traumatic	(1)	4,320,000	4,100,000	7,000	6,000	98	75	4:15	4:05
Sciatica	(2)	4,850,000	4,975,000	7,700	8,900	81	82	4:03	3:15
Synovitis	(1)	4,790,000	4,200,000	6,600	6,600	84	80	:35	:25

It should be noted that in all groups except the sciatica cases the average red cell count was below 4,500,000 after treatment, the same tendency to a decrease holding good also for the white cells. The hemoglobin content remained virtually uninfluenced by the fango therapy. The average rate of sedimentation revealed a change in the atrophic arthritis group from 57 minutes prior to treatment to 80 minutes at the conclusion of the course. Certain variations of this average will be discussed below.

Average number of individual treatments. — It was already pointed out that the number of treatments to be given is determined by the response of each individual case. Naturally in our group of 25 patients the number given varied. From a statistical point of view it may be of interest that we administered a total of 532 applications. Of these an average of approximately 22 were given to the group of patients who manifested a favorable response to the method, while those patients who did not seem to be rapidly and favorably effected were given an average of about 26 individual treatments.

TABLE 5. — *Results of Fango Treatment**

Diagnosis	No. Patients	Markedly Improved	Moderately Improved	Total Improved	Not Benefited
Atrophic Arthritis	15	4	7	11	4
Hypertrophic Arthritis	5	1	4	5	....
Traumatic Arthritis	1	....	1	1	....
Sciatica	3	2	1	3	....
Synovitis	1	....	....	....	1
Total	25	7	13	20	5

* Owing to the small number of patients in several groups, percentages have been omitted because of their negative statistical value.

Evaluation of Clinical Results. — Table 5 shows that 20 of the patients were benefited in a variable degree from the courses of fango treatment. Only 5 of the patients received no benefit. Without here entering into a detailed discussion of each individual case, it should not be overlooked that, as was already pointed out, we have investigated the fango treatment on patients

who have had their diverse pathologic processes for years and for which the accepted methods of therapy had proved ineffective.

Furthermore the fango treatment has been given exclusively, so that whatever results were obtained are attributable solely to this agent. It is seen from table 5 that out of 15 patients with atrophic arthritis, 4 have been markedly improved and 7 freed from their distressing symptoms — pain and restriction of motion. All 5 patients with hypertrophic arthritis were considerably benefited. Of the 3 patients with sciatica, who have had this affection in a pronounced type, 2 made what may be clinically regarded as a recovery, while the third received considerable amelioration, as did the patient with traumatic arthritis. On the other hand the patient with synovitis obtained only such an ephemeral relief as to be classified as unimproved.

Report of Cases

The following three cases typify our series with regard to both the beneficial effects and the negative results of pelotherapy.

CASE 1. — (No. G3225) J. B. aged 63, laborer, was first seen August 21, 1936. His principal complaint was pain in the shoulder, knees and back of more than one year's duration, which greatly hampered him in his work. His disability began in the shoulders and progressively involved the wrists and knees. Bad weather does not aggravate his symptoms. His past history is essentially negative except that treatments of his condition including the removal of all teeth had produced no effect. He is allergic to head colds. His family history is of no significance except that his father has had some type of rheumatic disorder.

Physical examination revealed a well-nourished man of 177½ lbs. whose weight preceding his disability could not be determined. Pulse 86, temperature 97.6 F. Urine negative. Blood examination revealed 4,250,000 erythrocytes, 12,000 leukocytes, hemoglobin 80 per cent. The initial sedimentation rate was 30 minutes. With the exception of a chronic pharyngitis he had no associated conditions. His articulations of the upper extremities were tender and partly stiffened so that the patient was unable to raise his arms above a very few degrees.

With a diagnosis of atrophic polyarthritis it was decided to treat the upper extremities only and seven fango applications were given over a period of three weeks. During this course his blood was subjected to repeated tests, which revealed a gradual but decided improvement of the sedimentation rate, which at the conclusion of the course was recorded as 4 hours and 20 minutes. Contrary to general acceptance, it may be assumed that this rate of sedimentation is not normal but indicates hydration of the protein particles of the blood in contrast to a too rapid sedimentation rate which indicates dehydration of the particles. The red blood cells had increased at the conclusion of the treatments to 4,450,000 red cells, while the white cells showed a drop to 8,550, and the hemoglobin an increase to 98 per cent. Clinically the patient was discharged as markedly improved not only symptomatically but functionally, because he was able to raise his arms to almost normal level without pain or effort. The accompanying illustrations (figs. 1, 2) show the condition before and after treatment more vividly than can be given by a description. It is not without interest to point out that the condition of the knees which had not been given any treatment remained unchanged (tenderness to pressure and motion). A follow-up examination made on February 18, 1937 still showed the state as just reported.

CASE 2. — (No. 83225) J. W. aged 57, Italian laborer, was first seen November 17, 1936. His principal complaint was swelling of the fingers and ankles of more than three years' duration which had gradually involved the hands, wrists, and elbows. His past and familial histories have no bearing on the case, except that inclement weather aggravates his complaints.

Physical examination revealed the following data. His bodily weight was 202 lbs. as compared with 232 lbs. before the gradual onset of his disability. With the exception of small but markedly hyperemic tonsils no associated condition was found. Pulse 66, temperature normal. Urine negative. Blood on first examination showed 4,970,000 red cells, 11,150 white cells, hemoglobin 80 per cent and a sedimentation rate of 45 minutes. His metacarpo-phalangeal joints are swelled, tender, with the left forefinger and the middle finger in subluxation. The patient is unable to close his fist, a condition seriously interfering with manual labor. Diagnosis — atrophic polyarthritis.

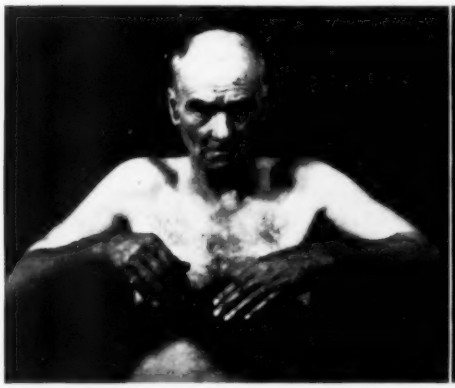

Fig. 1. — Atrophic arthritis involving hands, elbows, particularly the shoulder region and indicating limitation and loss of function.

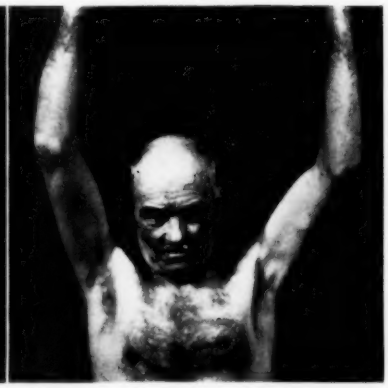

Fig. 2. — Definite improvement after 7 fango treatments.

This patient was given 50 fango treatments over a period of 14 weeks with the result that he was greatly relieved of the symptoms and was able to close his fist, as is shown in the accompanying illustrations (figs. 3, 4). His blood count at the termination of the course showed 4,730,000 red and 8,750 white cells, an increase of the hemoglobin by 10 per cent, and considerable slowing (60 minutes) of the sedimentation rate, which is interpreted as a favorable effect of the fango treatment also on the somatic state.

Case 3. — (No. F 70096) W. E. S. aged 54, laborer of German descent, was first seen February 20, 1936, for the principal complaint of pain and swelling of both knees of more than two years' duration. His history shows that the disability had begun in the knees and had gradually extended to the ankles, shoulders and terminal phalanges. He suffered about thirty years ago from what was diagnosed as anthrax fever, which confined him for six months to bed. Otherwise his personal and familial histories are irrelevant.

Physical examination gave the following data: Weight 150 lbs. (there had been an indetermined loss), pulse 88, temperature 98 F. All other organs normal. Urinalysis negative. His initial blood test showed 5,100,000 red, 5,500 white cells, 65 per cent hemoglobin, and a sedimentation rate of 30 minutes. His principal condition was in the knees, which were swelled, painful to touch and motion, and showed some fluctuation. The terminal phalanges were enlarged but not painful. Diagnosis — chronic synovitis.

Fig. 3. — Atrophic arthritis of hands and fingers, showing atrophic and deforming changes with inability to flex fingers beyond that illustrated above.

This patient was given 67 applications of fango to the knees over a period of 16 weeks, with the result that while his pain was moderately improved, the swelling in the knees remained uninfluenced, for which reason, as was pointed out in the text,

Fig. 4. — Improved muscle tone and function of hands and fingers following a series of mud treatments.

it was deemed proper to classify the result as negative. The accompanying illustration (fig. 5) shows the extent of the involvement of the articulations.

In this case, too, repeated blood tests were made. The last check made June 19, 1937, revealed 3,350,000 red, and 9,200 white cells, hemoglobin 60 per cent and the sedimentation rate that increased in rapidity to 18 minutes.

It is deemed important to invite attention to the fact that this patient was examined also radiologically and that the x-rays revealed roughening of the upper margin of the tibia, which was interpreted as possibly tuberculous in nature. This may account for the failure of the fango applications to produce a decided clinical amelioration except in the relief of pain.

Discussion

Our observations show that fango treatment produces amelioration in at least 80 per cent of the cases which, as will be shown below, corresponds with the findings of observers who have utilized a material of 35,000 patients. It is generally known that the favorable percentage obtained with any of the known methods now in common use does not exceed 70. In evaluating our observations on a basis of percentage it should also not be overlooked, as has already been pointed out, that we have purposely restricted ourselves to fango and have ignored auxiliary measures which might possibly have enhanced the results. Thus ordinarily it would have been necessary to overcome focal infection and to introduce measures against the associated conditions shown above in table 3. This particular problem of combined treatment will be submitted in a future report.

Goldstern and Katunsky[6] have published their observations in the Vienna Fango Heilanstalt on the therapeutic effects of fango treatment in conditions similar to our own (table 6).

It may be pertinent to explain the better results obtained in this institution partly by the circumstance that the overwhelming majority have either been referred for special treatment by the Austro-Hungarian Government during the war or general hospitals, and partly by the number of private individuals, all of whom have had the benefit of other indicated measures. It is therefore of interest to point out that in spite of our restricted method

Fig. 5. — Synovitis with swelling of ankles and knees unimproved by fango treatment. The changes in bone about the articulations of the knees suggests a tuberculosis background.

TABLE 6. — *Results of Treatments at Fango Heilanstalt in Vienna*

	Total Patients	Improved %	Virtually Cured %	Total %	Not Improved %
Polyarthritis rheumatica	5200	60.	20.5	80.5	19.5
Muscular rheumatism and lumbago	5700	57.5	26.	83.5	16.5
Chronic polyarthritis	5200	66.5	20.	86.5	13.5
Chronic monoarthritis	4400	67.	20.	87.	13.
Arthritis deformans	1300	42.5	11.	53.5	46.5
Pes planus	1000	81.	.....	81.	19.
Traumatic arthritis	2100	59.5	27.5	87.	13.
Sciatica	7400	60.	20.5	80.5	19.5

the results closely approach those obtained under more extended clinical management.

Conclusions

Twenty-five unselected cases of chronic arthritis and allied conditions were treated by topical applications of fango to the entire exclusion of any indicated causal or symptomatic therapy.

All patients have had their disability for a number of years without having derived any improvement from preceding treatments.

All but 5 of the patients (80 per cent) experienced decided improvement after a course averaging 20 applications.

The effects of fango are attributable to the low specificity and low conductivity of heat facilitating prolonged thermic influence at controllable temperature. The moisture contained in the preparation exerts an effect of a cataplasm, while the plasticity of the material produces an even pressure on the tissues. The heat no doubt has the well known effects on inflammation and exudates.

On a basis of the limited material and in consideration of other reports, fango treatment is a valuable adjunct to the therapy of inflammatory processes commonly regarded as rheumatic in nature.

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(Discussions of this paper will be published in an early issue.)

Free Course in Special Endocrine Diagnosis and Short Wave Therapy

Announcement has been made of a free course of instruction by Dr. Jules Samuels of Amsterdam, Holland, for the purpose of acquainting the medical profession with his method of diagnosing and treating endocrine and related grave disturbances by means of the Electrodiagram and his special technic of short wave treatment. The course will be given July 18 to 24th next. This special instruction is limited to ethical physicians and their assistants. The course will comprise an introduction to endogenous endocrine therapy and short wave treatment of the hypophysis; the cycloscopic method of examination; method of photographing the cyclogram; analysis of the endocrine system with the cyclogram; analysis of the endocrine system with Samuels' electrodiagram and dosimetry of endocrine therapy. Those interested should advise the doctor without delay in order to arrange for their attendance and should address Dr. Jules Samuels, Weteringschans 73, Amsterdam, Holland.

VASCULAR INSTABILITY IN DEVELOPMENT OF ENDOCARDITIS *

A. J. NEDZEL, M.D.

CHICAGO

It seems that we are easily inclined to establish different types of diseases, forgetting that there are no diseases but sick persons, and that one and the same individual at different times is a different one. It seems also that it is quite possible that articular rheumatism (which involves the heart), verrucous endocarditis, endocarditis lenta and ulcerative endocarditis are in close interrelationship, being only different manifestations of the same disease (Hassencamp[1]). Different individuals being in different physiologic states and having variable properties of defense, reveal different clinical entities.

It is quite common to explain the development of all types of endocarditides by infection, differing in the types of microorganisms. A large school of thought accepts the thesis that rheumatic endocarditis is caused by some microorganism. Unable to establish a direct connection between rheumatic endocarditis and bacteria, they express a view (McCallum[2]) that rheumatism is caused by some specific infection not recognizable at present because of inadequacy of technical methods. This school is apparently in agreement that it seems very improbable that the numerous bacteria that have been so far isolated from rheumatic cases have a true etiologic relation to disease.

In bacterial endocarditis the organisms involved are most often streptococci, but a whole series of other organisms have been found to be occasionally associated, and the variability of bacteriologic findings in the endocarditides evidences the importance of the reaction of the macroorganism to the infection. It is the greater frequency of blood stream invasion and simultaneous change in the function of tissues receiving the bacteria and not the specific selectivity on the part of the invading organism. The microorganism should be relegated to the background and the conditioning factors that may influence its localization emphasized.

It is generally agreed that a damaged valve will be more susceptible to later affections. Clinicians lately detect more damaged heart valves than previously. They also agree that many cases of endocarditides escape detection and observations on post mortem material (Leary[3]) substantiate these statements. Rothschild, Kugel and Gross,[4] in studying autopsy material from 161 cases of rheumatic cardiovalvular disease state, that it is striking to note the high grade of mechanical defect existing in individuals living even to the fifth and sixth decade with little or no evidence of congestive failure.

Causative Factors

We know now that endocarditis is primarily a disease of the northern latitudes, where the meteorological changes are especially pronounced. It is seasonal in its onset and the late winter and spring is the time when the macroorganism is fatigued from constant adjustments to the changeable weather conditions. Young people more readily succumb to it, and we know that in the young individuals the vascular system is more responsive to external influences. These three factors are the most important and the most common and are well substantiated by statistical studies.

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* Read at the Sixteenth Annual Session of the American Congress of Physical Therapy, Cincinnati, Ohio, September 24, 1937.

In following the functional status of endothelial permeability day by day, Petersen[5] found that the functional state varies. As the organism as a whole swings through its regular (or irregular) phase difference that is designated ARS (anabolism, reduction, spasm) to COD (catabolism, oxidation, dilatation) and vice versa, the endothelium becomes more permeable during the COD phase and less so with the ARS phase. The ARS phase involves a pressor increase and the greater its exaggeration the greater the effect of chemical stimulation in certain parts of the endothelium and the greater the possibility for anoxemic conditions in certain portions of the organism. With periods of anoxemic stimulation or following mechanical stimulation, the endothelium, as before stated, does not only become more permeable, but also becomes "sticky"—a physico-chemical change that involves changes in the electrical charge, etc.

Such phase changes may be initiated by many general factors (endocrine, nutritive, toxic) but are most commonly associated with swings in biologic rhythm that are set in motion by the effort to adapt the organism to the shifting cyclonic circulation of the atmosphere (Petersen).

There is every reason to believe that all the endothelium of the body will be more or less involved in such periods of relatively lessened or increased activity, of lessened or increased adhesiveness.

Incidental to this changing rhythm of ARS and COD phases, the pressor relations of the vascular system are altered. Periods of high blood pressure (ARS phase-spasm) are followed by periods of low blood pressure (COD phase), because with a period of spasm an anoxemia prevails in certain tissues. This causes stimulation, products of incomplete tissue metabolism are released and thrown into the circulation, capillaries are dilated (CO^2 accumulates) and the diastolic blood pressure falls. The vascular bed becomes wider.

This pressor episode has its reflection in the heart's action. The increase in pressure will cause more work for the left heart, the right will not be affected to any great extent. The margins of the valves will impinge upon each other more forcibly and as a consequence, the marginal endothelium in such a region will be mechanically stimulated to a greater degree. The aortic and the mitral marginal zones will be selectively stimulated and selectively more adhesive.

The manifestation of the pressor episodes (rising of blood pressure levels) of which we speak here is caused by a characteristic status in the vascular bed, particularly of small arterioles and capillaries. A pressor episode, a pressor crisis (Pal crisis), the ARS phase of Petersen, *Hochspannungskrise* of the Germans, represent a period of relative sympathicotonia, when, with adrenal and pituitary preponderance, both systolic and diastolic blood pressure are increased. At the same time there is usually an increase in the blood pH and a decrease in the CO^2 content. During this period there is a tendency to contraction of the smaller vessels and capillaries and with this a relative anoxia may exist in the various regions. Following this phase a corrective one sets in which is initiated by the accumulation of acids produced by anoxia; by capillary active substances, and by an increase in thyroid secretion. Constant pendulation of pressor crests with corrective phases of vascular dilatation are commonly initiated by change in the atmospheric circulation in our latitude, but, needless to state, a multitude of intercurrent events (psychic, physical activity, trauma) may bring about similar though usually transient episodes of this character.

Experimental Evidence

Based on the aforesaid, there were set up a series of experiments on dogs in which artificial pressor episodes were induced by pitressin injections. The latter causes a rise in blood pressure by stimulating the blood vessels—through peripheral action (Geiling[6]), evoking constriction of the finer arterioles and

capillaries. This action of pitressin is similar to the action of meteorological factors (polar infalls) which we constantly encounter.

Our experiments fall into three groups. In the first group after the pitressin injection we sacrificed the dogs at different time intervals (from 1 to 48 hours). Histologic slides of the valves (preferably bicuspid) were made and the endothelium examined.

Normally, the nuclei of valvular endothelium are placed horizontally, they project slightly above the surface, the cytoplasm is relatively small in amount and the subendothelial structures are relatively firm and compact.

After pitressin injection we first witness a gradual increase in the amount of cytoplasm, which becomes apparent as a thickening of the endothelial surface. This then proceeds to the point where the nuclei no longer project so prominently above the surface. Finally, a considerable amount of cytoplasm begins to cover the nuclear surface.

In the next stage the nuclei of the endothelial cells become rounded as the latter become hydrated, and gradually the axis of the cell changes, so that the trend is perpendicular to the surface although the superficial outline of the surface is still maintained. Now, with continuation of the process, the superficial surface becomes roughened and individual cells of the endothelium begin to show vacuolization and apparently their attachment to the subendothelial structures becomes less firm. They project freely on the surface. From this stage the membrane tends to present a stringy, mucoid surface.

Occasionally we may actually find bacterial inclusions in the valves of the dogs, which have had pitressin injections but in which bacteria have not been injected subsequently. In other words, these endothelial surfaces will, even under such conditions, present foci, where adventitious bacteria can readily localize.

If the endocardium has been conditioned by the pressor episodes during the time of the year when bacterial penetration through the mucous membrane is more common in man and animals (late winter and spring) we may anticipate that bacterial localization may follow even without artificial inoculation of bacteria. We have observed two dogs, in which after mere pitressin injections an ulcerative bacterial endocarditis has developed, when due time was given (up to 2-3 weeks).

Apart from the changes in the endothelial surfaces, changes occur in the valves in the subendothelial tissues. These consist primarily of hemorrhage which ultimately leaves traces in pigment deposition, with gradual phagocytosis of the granules by the local hystocytes, and secondly, of an edema of hydration of the tissues.

In a second group of experiments the pitressin injections were followed by injection of suspension of india ink or bacteria (Staphylococcus aureus and Streptococcus hemolyticus). The dogs were killed in 1 to 23 days. Pieces of the valves were examined for presence of bacteria and india ink. The unstained tissue with the shadowy line of the endothelium reveals localization of carbon particles. In the bacterial series we can first observe the adhesion of occasional cocci. Later, it was observed that this process has extended and finally proliferation occurred and large numbers of bacteria could be seen both on the surface as well as in the deeper layers. Not only does the altered endothelium offer an ideal adhesive surface and with this, of course, an actual increase in the surface area, but the cells themselves evidently permit rapid proliferation.

Macroscopically in the dog the first evidence of a successfully localized infection (one to thirty-six hours after the injection of bacteria) is represented by a pin point to pin head—sized, slightly elevated, hyperemic, round lesion on the valvular surface. The lesions may be multiple and they may be confluent. In some instances the color is pale pink but may be slightly reddish with a yellowish cast. Later, the lesion may consist of a slightly raised series of reddish

excrescences along the valvular contact surface. We may see also the lesions as slightly raised and orange-colored excrescences extending along the valvular surface near the base of the valve. Then there are observed roughened hemorrhagic marginal zones extending along the base of the valve, and the valvular margins being markedly hemorrhagic, edematous and revealing a number of definite nodules.

Finally we have seen a large lesion with hemorrhagic base and with innumerable small vegetables that project above the surface, in gross appearance a lesion that obviously approaches that which is observed in the human.

In a third group of experiments the dogs after pitressin injections (single or repeated) were killed at different time intervals (from 7 hours to 75 days) and the subendothelial layers of the valves were studied.

In the vast majority of cases the dogs, after immediate reaction, fully recovered and showed no signs of illness. But in killed animals macroscopical changes were seen, from pin point hemorrhage and edema to a thickening of the valve in toto and formation of verrucae, similar to the ones that are characteristic for rheumatic endocarditis.

The initial changes in the endothelium of the valves and the macroscopic findings were the same in the cases which represented the first stages of bacterial endocarditis and in cases, which showed absence of bacteria and signs of healing (with scar formation and rheumatic-like verrucae). The subendothelial tissue showed marked and pronounced changes. We find the fibroblasts proliferating very actively and gradually assuming a perpendicular position to the valvular surface, i.e., they form palisades. In some places these fibroblasts proliferated beyond the valvular surface, thus forming a base for verrucae. Later, vascularization is observed and we find a true verruca, mostly covered by endothelium.

The fibroblasts, forming the palisades, with time also form *scars*. These scars are of different size and location. They come close to the surface, entirely changing the normal appearance of this affected part of the valve. The scar tissue sometimes extends above the valvular surface in such manner, as to resemble a small verruca. In other cases we found the scar tissue at the base of the formed verrucae and also found it scattered all over in the deeper tissue of the valve. In other words the fibroblasts wherever they appear (as a result of induced pressor episodes) in due time form dense fibrous tissue that characterizes the stage of repair from the injury which has been inflicted to the valve.

There is observed the appearance of a round cell infiltration. The single mononuclears are seen scattered all over the injured tissue as well as gathered in small nodules. These do not exactly resemble the Aschoff bodies of the heart muscle, but if a due allowance is made for the differences in histologic structure of the valve, we may consider them as analogous.

(The detailed photographs and microphotographs are published elsewhere.[7])

The reported findings emphasize the role of the status of the vascular bed in the development of endocarditis, no matter of what type this endocarditis may be. Any factor, (constitutional vasomotorlability, emotional excitement, meteorologic environment, and the like), which may condition the pressor episodes, might lead to the development of bland endocarditis. Bacterial endocarditis presents the end result where bacterial adhesion and proliferation have been added to the primary change in the endothelial status.

Clinical Implications

These observations, based on experimental material, and a large clinical material collected by Petersen[5] should theoretically at least suggest possibilities in physical therapeutic applications. In the first place, we must consider a dis-

tinct phase difference (ARS and COD) which is constantly occurring in the organism. These phases take place within certain limits. If they are pushed beyond these limits, or there is an evidence of autonomic disintegration, the foci of inadequacy can no longer make prompt adjustment. Königer[8] first pointed out the dependence of therapeutic measures on the state of physiologic irritability and used as an example the diurnal rhythm (noon and afternoon—marked change in activity, increase in irritability and fever, during night—decrease in irritability with diminuation of irritability of the respiratory center). He considers that the phase of the daily rhythm is of importance in treatment and particularly for the milder methods such as massage, application of heat and cold, diet, and similar therapeutic measures. He also calls attention to the importance of menstruation, pregnancy, season, and climatic influences.

In our latitudes the pressor episodes evoked by polar infalls play an outstanding rôle. They cause a vascular spasm in different regions of our body, similar to the pitressin action, which leads also to pathologic changes in other parts of the body, as stomach, liver, central nervous system, which has been observed by us experimentally. These pathologic findings in different organs were observed mostly in the late winter and spring, the animals being more responsive in these seasons. Physical therapeutic agents acting upon the skin, invoke changes in the given status of splanchnoperipheral balance. By altering it, they act (especially in cases of an autonomic disintegration) to the best or worst. In these applications we should always look upon the physiologic state of the patient at the time of treatment, for he will react to them differently, depending upon the phase, in which he is. If he is stimulated, the added stimulation will do him more harm than good and the individuals whose vascular system is unstable (the autonomic disintegration is evident) are especially liable to be damaged. The phase, which is extended beyond the certain limit, and is enhanced by added physical therapeutic measures, especially applied to the skin, results in aggravation of the symptoms (disease), because there cannot be prompt readjustments on the part of the patient.

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(For discussions, turn to page 345)

LIMITATIONS OF ALTERNATE SUCTION AND PRESSURE IN PERIPHERAL OBLITERATIVE VASCULAR DISEASES *

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NEW ORLEANS

In the past twenty months we have treated by the alternate suction and pressure method 74 patients with obliterative vascular disease. An adequate number of subjects have thus been treated over a sufficient period to permit definite conclusions concerning the value of this type of therapy.

From the standpoint of the underlying pathology these cases include: Two cases of traumatic occlusion of the brachial artery, due respectively to a knife wound and a blow from a heavy piece of wood; 8 cases of Raynaud's syndrome, in 2 instances associated with scleroderma; 3 cases of Buerger's syndrome; 61 cases of arteriosclerotic disease, in 23 cases associated with gangrene.

Both patients with traumatic occlusion of the brachial artery responded rapidly to treatment. The eight patients with Raynaud's syndrome and the three with Buerger's disease failed to respond. Those with Raynaud's disease were actually made worse, every attempt at treatment having been followed in from ten to thirty minutes by cyanosis and pain. In the arteriosclerotic group the method failed entirely in 26, but the remaining 36 patients, some of whom exhibited gangrene, were completely relieved of their symptoms or definitely improved. Accordingly in the entire group of 74 patients the alternate suction and pressure type of therapy was of distinct value in 38, that is, slightly over half of the total number, and of no value or actually harmful in 36 cases.

The mere presentation of such statistics throws no light upon the results to be achieved by this type of therapy. It does, however, emphasize a fact which impressed us from the beginning of our use of the alternate suction and pressure method and which parallels the observations of others,[1, 2] namely, the variability and uncertainty of its results. The question arises why, if this form of therapy is physiologically sound, it should not always be effective when it is applied in the same manner and presumably for the same type of disease.

A careful study of our individual cases suggests that the degree of vascular obstruction when the patient is first seen almost invariably determines the end result. We have made this point in a previous communication,[3] but critical analysis of reports from other clinics would indicate that very little attention has been paid to this aspect. For this reason, and in the light of our increasing experience with this relatively new type of therapy, we feel justified in again emphasizing the almost mechanical exactness with which the initial degree of circulatory impairment parallels the end results of treatment.

From the very beginning we selected our cases in the sense that we ruled out conditions often mistaken for peripheral vascular disease. A comprehensive history was taken, followed by the routine and special examinations indicated under the circumstances. These precautions, however, soon seemed inadequate, and we instituted the plan of studying each case from other angles. First, we exercised increasing care in obtaining a detailed his-

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tory. We ascertained the exact onset of symptoms and their progressive development as well as all possible predisposing factors. This included a careful physical examination, noting not only the gross changes but also the response to exercise. As an additional precaution we studied a representative group of 28 cases, by means of arteriography, to determine the exact vascular pathologic process and its degree as compared with normal standards. In another group of cases, some of which were also included in the preceding group, we studied the changes in the oxygen content of the superficial and deep venous blood of the extremity before and immediately after one hour's treatment.

Theory of Alternate Suction and Pressure

Alternate suction and pressure therapy is based upon the theory that by lowering the peripheral resistance of the part, more blood will flow through the affected area of the vascular system.[4] Herrmann and Reid[5] demonstrated that an elevation of the temperature of the part begins within five minutes after treatment is instituted, and in favorable cases may persist for as long as forty-eight hours after it is concluded. It must not be forgotten, however, that for this to happen the groundwork, if we may so express it, must be favorable. For one thing, a certain amount of blood must be available in the extremity if the flow to the obstructed area is to be increased. For another, either non-functioning vessels must be available in the extremity to take care of the increased blood volume, or such functioning vessels as are available must be capable of dilating. From these premises is derived the conclusion that the degree of vascular damage when treatment is undertaken is really the determining factor in the end result.

In our own clinic[6] we have been able to show that there is a rise in the oxygen content of the superficial or deep venous blood of the affected extremity, or of both venous systems, after an hour of treatment in those cases which showed improvement, while an increase seldom took place in those in which improvement did not occur. We have been able, furthermore, to demonstrate by arteriography the relationship between the degree of vascular occlusion initially present, the changes in the blood oxygen content before and after treatment, and the end results of treatment. In patients with a mild degree of vascular occlusion or an extensive development of the collateral circulation, treatment produced a more or less marked rise in the oxygen content of the venous blood with good results. In instances of high obstruction of the femoral artery, or extensive obliteration of the vascular tree associated with a scanty development of the collateral circulation, there was either no change in the blood oxygen content after treatment, or an actual fall, and the end results were poor.

Our previous arteriographic studies [7, 8] in arteriosclerosis have made it possible for us to group it into three main classifications. In the first group the larger arterial trunks are principally affected, though not necessarily in the same way. There may be a uniform narrowing of all the vessels with obliterative changes only at certain points, such as the popliteal artery or the origin of the tibial vessels. There may be a localized narrowing at various points caused by atheromatous plaques which extend into the vascular lumen. Invariably associated with the changes in the large vessels is a secondary diminution in the number of functioning small arteries, arterioles and capillaries. The collateral development varies widely in this first group; it may be abundant, but it may also be scanty or absent.

In the second group the most important changes occur in the small muscular branches, the arterioles and the capillaries. The total blood volume of the extremity may seem adequate, but the local supply to the muscular

fibers is insufficient because the smaller vessels are occluded. The blood is shunted around these areas of obstruction, as it were, returning to the venous circulation without intermediate nutrition of the affected areas. This is the so-called arteriolosclerotic type of disease, a variety which is particularly likely to mislead and confuse the physician. The type of pathologic process is such that in spite of the patient's symptoms of obstruction or even exhibition of gangrene, the pulsation in the main vessels is often excellent and the occlusion of the smaller vessels, which is the cause of the trouble, may be entirely overlooked.

In the third group there is a gradual obliteration of both the large trunks and their immediate branches and of the smaller muscular branches, arterioles and capillaries as well. Usually the collateral circulation is poor or it may be altogether lacking. Obviously this is the most serious type of disease. The pathologic changes tend to be progressive and the majority of cases terminate in gangrene, regardless of the therapy instituted.

Classification of Arteriosclerotic Disease

On the basis of the underlying degree of vascular occlusion we have classified our 61 cases of arteriosclerotic disease into four groups. Group 1, consisting of 20 patients, includes those whose major complaint was exercise pain. There were also other evidences of arteriosclerosis, sometimes associated with dependent cyanosis and pallor on elevation of the extremity. There was never pain during rest, and exercise could be tolerated up to a certain point, indicating that only after this level was reached did the circulation become inadequate. Arteriographic studies showed only a mild degree of obliteration or a well-developed collateral circulation. In view of these favorable circumstances it was not surprising that 16 of the 20 patients in this group showed distinct improvement after treatment.

Group 2, consisting of 18 cases, included those with varying degrees of gangrene. In this type the gangrene usually receives the major share of the physician's attention, although actually it is less important than the underlying vascular occlusion, which does not necessarily parallel it. As a rule, the occlusion is extensive when the gangrene is spontaneous, though it may be slight when the gangrene is of traumatic origin. In the 18 cases in this group there were 10 immediate good results. In three cases the gangrene recurred and even after further treatment amputation was necessary in one of these. In the other two cases the second course of treatment again gave good results. The remaining eight cases required surgical measures.

Group 3 consists of 7 cases in which an indolent chronic ulcer of the toe or foot was superimposed upon varying degrees of vascular occlusion, usually of a rather marked degree when the ulcer was non-traumatic in origin. In 4 cases the results of treatment were good, but in three the ulcer failed to heal.

Group 4 consists of 16 patients who exhibited both exercise and rest pain, and in whom as would be expected, the degree of vascular obliteration was extensive and involved both the large trunks and the small branches. Only 6 in this group showed improvement under treatment. All were of the arteriolosclerotic type, and the problem since the large vessels were patent, was merely to develop a collateral circulation through the small branches. In the 10 cases in which treatment failed completely the preliminary studies showed a marked degree of vascular occlusion, with a small blood supply and little or no development of the collateral circulation. In the group of failures are included five individuals who developed gangrene which required amputation of the part after they had received respectively 16, 35, 177, 222, and 335 hours of treatment.

In the light of this wide variety of results and particularly of the development of gangrene in certain patients under intensive treatment, what shall be said of this mode of therapy? Shall we discard it? Or shall we continue to use it in all cases, hoping for the best even when our common sense tells us sometimes to expect the worst? We believe that alternate suction and pressure therapy has a definite place in the management of obliterative vascular disease, but also that its advocates do it small service if they do not recognize its limitations and do not insist upon a very careful analysis of the underlying pathology of the individual case prior to deciding whether or not this mode of treatment shall be instituted.

Selection of Cases

On what basis shall the cases be selected? To consider contraindications first, we agree with Herrmann,[9] and Landis and Hitzrot[10] that all cases of extensive gangrene should be excluded, "extensive gangrene" meaning, in our experience, those cases in which the gangrenous changes have extended beyond the web of the toes and into the deeper tissues. Cases in which infection or bone necrosis is present are also unsuitable for this treatment. Surgery should be resorted to promptly under such circumstances, for conservative measures besides being time-consuming are not free from risk. We have made no distinction, however, between diabetic and non-diabetic subjects. In both types the process is primarily arteriosclerotic, the only difference being that the diabetic patient is younger and responds to infection to a degree which the purely arteriosclerotic subject does not. We were careful, of course, that in diabetic patients the metabolic process was under full control before treatment was instituted.

In the vasospastic group of diseases this therapy should be applied with the greatest caution, if at all. There would seem little reason, if the physiologic action of alternate suction and pressure therapy be borne in mind, to expect any special benefit from its application. In Raynaud's syndrome the underlying condition is arterial spasm caused, it is now generally believed, by an alteration in the neurogenic mechanism. Such a spasm is readily relieved by the application of various forms of heat, or by a break in the nerve pathways by sympathectomy, but is not relieved by the action of negative and positive pressure. This treatment may perhaps be beneficial in selected cases of Buerger's disease, when the inflammatory reaction has subsided and there is clear evidence of a residual impairment of the circulation due to obstruction of the arterial system, but no benefit can be expected in the early stages, when the inflammatory and vasospastic factors predominate. In traumatic occlusion on the other hand, the process is usually localized, the circulation elsewhere intact, and the results of treatment should be uniformly good. The most important prognostic criterion we have been able to establish is the correlation between the degree of development of the collateral circulation and the degree of vascular occlusion. If the patient has unaided developed an extensive or even moderate collateral circulation, the prognosis under treatment is good. If on the other hand, there is little evidence of such a natural attempt, the prognosis is poor.

The time element is also important. If the patient presents himself for treatment early in the course of his disease, his chances of improvement or possibly of cure, are good. If he presents himself late after extensive vascular obliteration has occurred, or after gangrenous changes have set in, he cannot hope for very much.

Finally the physician has a heavy responsibility. Many of these patients consult him early in their illness with vague complaints and indefinite physical changes, none of which he can afford to ignore. Early diagnosis is im-

perative. The physician who undertakes the treatment of obliterative vascular disease must thoroughly comprehend its manifestations and pathology. He must eliminate other conditions which simulate it, such as arthritis, neuritis, myositis, bony changes, and the various fatigue syndromes. He must furthermore, go beyond the mere diagnosis of obstructive arteriosclerotic disease. He must study his patient from every angle, objective as well as subjective. He must determine by such methods as seem most suitable the actual degree of vascular obliteration and the state of natural development of the collateral circulation. For our part, as we have pointed out, we prefer for this purpose arteriography and the study of the blood oxygen content before and after an hour's trial of treatment. After all the findings have been weighed and analyzed it is possible to determine what results are likely to follow this mode of therapy and whether the patient's best interests will be better served by it or by the institution of radical surgery.

This decision, we would emphasize, is a very important one. It is important to the hospital when public charges are in question, and it is perhaps even more important particularly to the private patient in moderate or limited circumstances. It cannot be denied that this type of therapy is time-consuming and expensive, and it is only fair that the patient should know before he undertakes it what it involves and what his chances are with regard to improvement or relief. Alternate suction and pressure therapy can be carried out in any well equipped physical therapy department, but the selection of cases is the duty of the physician who has mastered the nature of obliterative vascular disease and is able to recognize it in its earliest stages when therapy of the conservative type is still of value.

Summary

1. During the past twenty months we have treated by the alternate suction and pressure method 74 patients with obliterative vascular disease, 38 of whom were relieved or improved by this method.

2. Analysis of the individual cases shows that the degree of vascular pathologic involvement initially present is the most important factor in the success or failure of the method. This can be determined by arteriography and a study of the blood oxygen content of the affected extremity before and after tentative treatment.

3. Arteriography permits a classification of cases on the basis of the initial vascular process, which assures reliable prognostic criteria.

4. The physician has a heavy responsibility in the selection of cases for treatment because it is always unfair and often dangerous to submit to this conservative therapy those who are unlikely to be benefited, and whose interests would be better served by prompt, radical surgery.

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Discussions of Symposium on Vascular Disease

Dr. R. V. August (Muskegon, Mich.): Dr. Nedzel raises a question of the possibility of pituitary pressure principles being used in the practice of surgery, and possibly leaving the same phenomena as pitressin does in dogs. Dr. Harpuder's observations on tissue metabolism will certainly go far in giving understanding of diseases under discussion. There are many portholes through which we may peer at the mechanism of tissue metabolism. We hope to have more, particularly on the metabolism of glucose and nitrogen which was not covered.

Regarding peripheral vascular diseases, in the majority of cases a clear-cut decision may be reached between medical and surgical treatment, or varying degrees of both in combination. It seems to be the consensus of opinion that treatment will yield best results when begun earliest, so that the problem is to follow early diagnosis with early treatment.

There is a slight difference of opinion between several of the speakers on the method to be used in producing hyperemia. I come from a small center of population, and there physicians are not privileged to make extensive first-hand observations on any single group of cases, so it would be difficult for me to discuss these differences of opinion. I have seen a few cases with incipient gangrene in the lower extremity, and these were treated first with heat and radiation therapy. Passive vascular exercises have been used as a follow-up treatment. I am not acquainted with the method used by Dr. Collens and Dr. Wilensky. Anyhow, all of our cases finally terminated by having mid-thigh amputation.

I feel that the answer in this instance has already been stated by Dr. Herrmann. First, attempt to insure ample collateral circulation. When this has been established, follow with radiation, heat, and other methods of increasing tissue metabolism. Had we done this, I am certain that several of our patients would now be walking on two legs instead of one leg and a crutch. There is one question I would like to ask some of the speakers, and that is whether or not they allow patients to use cigars and smoking tobaccos that are supposed to have most of the nicotine removed.

Dr. Paul Merrell (Indianapolis): The growing conservative attitude toward peripheral vascular diseases has within the past few years found expression in the more active education of patients, in a wider and more meticulous use of all of the measures dealing with the local hygiene of the feet, general health, optimum position for the resting extremities, and the prevention of mechanical and thermal trauma. Reid, in the October issue of Annals of Surgery of 1932, gave some very pertinent suggestions as to the general care of extremities with peripheral vascular diseases. These points have been emphasized repeatedly and undoubtedly have been of tremendous value in tiding many patients over the threatening stages of many circulatory disturbances until an adequate circulation could be developed.

Needless to say we all should recognize the importance of knowing the physiology involved before attempting to treat peripheral vascular diseases. The study of this seemingly has lagged somewhat behind the attempt at therapy. For this reason I was much interested in Dr. Harpuder's paper. The points he made in regard to the differences in the oxygen, carbon dioxide, lactic acid, and glucose content of the blood in an extremity; first, one that is trained; second, a foot that is untrained or, may I suggest, a foot not used to strenuous exercising; third, the extremity in which the circulation has been impaired. The differences in the blood changes as he secured them through experimentation is important in that one should recognize the importance of rest or, should I say, cessation of activity until the interchange of blood is sufficient to carry on the activity of the extremity. In other words, the importance of not exercising this extremity more than there is sufficient oxygenated blood to carry on such exercise. The statement Dr. Harpuder makes in regard to the discoloration of a foot and his explanation of this phenomenon is an interesting observation.

I want to re-emphasize the importance of accurate diagnosis before instituting therapy. Dr. Herrmann has described to you the importance of using the constant temperature room. Dr. Veal has em-

phasized the importance of arteriography in making the diagnosis and also forming a tentative prognosis. May I add this further suggestion as a help in making a diagnosis. We have used the method, as suggested by Allen, of giving an intravenous anesthetic, then taking an oscillometric and thermocouple reading every few minutes to determine the type of lesion. Twelve patients have been so studied. The amount of vasospasm or true organic changes can be estimated from this procedure. Naturally there are other important items to be considered in making a diagnosis.

The discussion of intermittent venous occlusion in the treatment of peripheral vascular diseases was interesting and while I have read previous reports upon the subject so far I have not used this form of therapy. Drs. Collens and Wilensky have given us something to consider in the form of therapy.

Dr. Frank H. Krusen (Rochester, Minn.): I am very pleased that Dr. Bierman brought up the question of priority. About two years ago I reported before this Congress on an apparatus that could be used and made by any well trained hospital mechanic, and during that particular discussion I showed the picture of a boot which was made in 1836 by Junod, which was controlled by means of a little hand pump, and is remarkable for its similarity with the boot that Dr. Herrmann has described. Dr. Herrmann's work has been the guiding factor in putting this particular type of physical treatment to the fore, and we all feel that great credit is due him for his remarkable work. I am inclined to believe that positive and negative phases are more important than simply intermittent and negative phases. I think that the work done by Landis, which I have watched closely for several years, evidences that fact. Therefore, it would seem that Dr. Collens' contention that intermittent venous seclusion alone, without the second phase which is used both by Landis and Gibson, of emptying the extremity either by a positive phase with suction pressure or by elevation with various exercises, or by elevation by the technic described by De Takats in which he uses a blood pressure cuff described by Collens and Wilensky, and followed by passive elevation by means of a small rope attached to the heel, is well worth considering.

I would like to ask Dr. Collens to comment upon this: Even though his method may be effective, it would seem to be even more effective if he were to use some mechanical method, either the simple device described by De Takats or some other mechanical method for producing a negative phase. I feel quite sure these elaborate devices we are using are important, but I would like to comment a moment on the simpler procedures and ask if some of them may not be equally effective — that is, the use of Allen's exercises, or the simple procedure described by De Takats. I am certain that the more elaborate devices will have to be employed, because we cannot use these simpler devices in all cases. However, I feel that we should point out that there are some simpler methods for use in the home.

Dr. Richard Kovács (New York): It is a fact, and there are several contributions in the literature, including some of my own, that the application of vasodilating drugs, notably mecholyl or acidylbetamethylcholoride, has a very satisfactory result in peripheral vascular disease due to a spastic condition, such as Raynaud's disease. Also, I wonder whether Dr. Herrmann or any other essayist had any experience with this form of treatment, because no mention has been made of it.

Dr. J. P. Talmadge (Lawrenceburg, Ind.): I want to ask a question. One essayist says that heat, especially diathermy, is contraindicated. I have been using active hyperemia in the way of heat for many years, but my experience in cases of gangrene is rather limited. While I thought that diathermy would be ideal, my experience has indicated that probably the essayist is right. But the question arises in my mind, why can we not use heat? Why is it contraindicated? I would like to have an answer to that question.

Dr. Heinrich F. Wolf (New York): I should like to ask Dr. Nedzel whether his remarks on endocarditis do not correspond to a similar process in the bronchial epithelium. This would explain the development of colds. It has been shown that application of cold to the skin of rabbits produces a collateral hyperemia in the bronchial mucosa. If this happens also in humans we could understand that bacteria which live on the mucous membrane as parasites multiply and become pathogenic.

Dr. Herrmann is correct if he warns against applying heat to the toes. We all know that by applying heat to the toes in gangrene severe damage has been done. No danger exists however if the heat is applied above the ankle.

As to the application of short waves which Dr. Collens has spoken of I would draw your attention to the experiments published in the ARCHIVES of last June and more recently reported at the first Congress on Short Wave Therapy in Vienna; namely, that low energies tend to produce a dilatation of the capillaries. Very low energies must be used to obtain this effect. I used only 90 watts. In Europe a maximum of 60 watts is generally used in the treatment of acute inflammatory processes. It would be interesting to study the effect of osmosis in cases of arteriosclerotic gangrene.

Some time ago I ligated the kidney of a rabbit and observed that the kidney increased to double its size. The reason for this, in my opinion, is the fact that the tissue broke down, the osmotic pressure in the kidney increased and fluid was attracted from the venous circulation. Bier's hyperemia could also be explained in that way. Bier experimented on suckling pigs

whose skin is white. He applied a tourniquet and stopped the arterial circulation completely. He then cut off the leg without ligating the arteries. In spite of the open arteries that part of the skin which was below the tourniquet became hyperemic. This can only be explained by osmotic forces and through an attraction of fluid to the kidney, which made it increase to double its size.

Dr. Disraeli Kobak (Chicago): This symposium on peripheral vascular disease is as exhaustive as it is well balanced, for which reason it is almost impossible to discuss the problems that were presented either as a whole or in detail. Accordingly I shall limit my remarks to two aspects of the subject. One is the scientific consideration by Dr. Herrmann of the various investigations that have preceded his labors. Thus his references to Junod as the pioneer in this field and such of his followers who have independently attempted to influence certain diseases of the extremities by the production of hemospasia by means of an environmental air vacuum is particularly praiseworthy because his apparatus manifests considerable originality. Of equal scientific value is Dr. Herrmann's acceptance of the underlying physiology of his method of treatment in the sense of an artificial hyperemia, for the concept of which he has given full credit to August Bier. It is only by such generous acceptance of historic research that modern medicine has risen to its present advanced stage. While Dr. Herrmann himself concedes that the procedure has not yet reached a stage of perfection, there is no gainsaying that he has contributed a vast amount of original investigation which is today utilized as the material for further development. Thus the growing consciousness on the part of the profession of the value of this method of managing certain types of peripheral vascular disease has served as a stimulus to both an attempt at simplification of the technical aspect and the more lucid interpretation of the underlying patho-physiologic phenomena.

Dr. Collens has introduced a modification which gives rise to the hope of enhanced results by less complicated apparatus. Such an opinion is justified by Collens' plethysmographic evidence of the effectiveness of a therapy which includes the use of short wave diathermy associated with rhythmic constriction of the blood vessels. Personally I am in a position to report a number of cases of a more or less grave type in which the mild dosage of short wave diathermy has produced considerable and prolonged relief. Accordingly the combination method employed by Collens and Wilensky appeals to me as a contribution in the right direction. It is reasonable to assume that with further experience there will be developed in the near future a simplified technic with superior therapeutic effectiveness on the basis of the present contributions to this important problem.

Dr. William Bierman (New York): I want to ask Dr. Herrmann why in his discussion he does not refer to the use of drugs as an additional method of treatment. Some time ago I had the opportunity of investigating the vasodilator and vasoconstrictor influence of various drug and food substances. The question is whether such a drug as acetylsalicylic acid is of value in the painful episodes of individuals who suffer from peripheral vascular diseases, whether it has been corroborated or negated that caffeine found in coffee is a vasoconstrictor, and therefore should be avoided by individuals suffering from these diseases. The same applies to tobacco.

At the Mount Sinai Hospital in New York, where we have been doing work with Dr. Silbert, we found that as Dr. Herrmann has indicated, ganglionectomy or sympathectomy in general is to be avoided. We have also used the apparatus designed by Dr. Collens, and have observed that in those conditions particularly where ulcers exist, the treatment was very satisfactory.

With reference to pressure and suction, I feel I would prefer to use the terminology of positive and negative pressure rather than passive vascular exercise, because we are quite sure that an increase of pressure does occur within the container in which the leg is placed, and also a decrease of pressure.

There is one question I would like to ask Dr. Herrmann which has been troubling me for some time and that pertains to constriction around the leg. When we think of vacuum or partial diminution and positive pressure, I think we are apt to lose sight of the fact that in order to create a partial diminution in atmospheric pressure in an apparatus such as this, it is necessary to perform some degree of constriction. I would like to get Dr. Herrmann's reaction as to its importance.

Dr. Alexander J. Nedzel (closing): Dr. August's question is a very practical one. There is a danger in the use of pitressin. Some of our experimental animals died immediately after injection of 10 units of this preparation. The doses given in our experiments were larger than those used in practice. Nevertheless, the animals, in which were found valvular lesions resembling those in a human rheumatic heart, seemed to be healthy. They had a cold nose, good appetite and were quite active and lively. Dr. Seed and his coworkers conducted a survey at the Cook County Hospital in Chicago on the action of pitressin in human beings and came to the conclusion that it is a powerful agent and should be used cautiously.

Dr. Wolf brought out an old and always new question of colds. The aim of this paper was to show that there does exist the so-called splanchno-peripheral balance. This balance was elicited in 1884 by Dastré and Morat. Their studies showed that in normal individuals within certain physiologic limits the autonomous nervous system acts as though it is com-

posed of two parts, constantly and simultaneously in opposite directions while at the same time balancing each other. Activation of one leads to immediate suppression of the other. One one side we have the splanchnic region and on the other the peripheral (skin, brain, heart, kidney, respiratory tract), which has called forth the concept of a pressor-depressor effect. So if we apply heat to the skin we get dilatation of blood vessels, and not only of the skin but also of the mucous membranes of the respiratory tract. If the skin is exposed to cold we also get contraction of the vascular net of the nose. The exposure of a person to cold or chilling him below the ankles or above, naturally will immediately have response in the vascular bed of the nose. The same is true for the kidneys, so the old authors spoke of "Erkältungs nephritides."

The prolonged contraction of blood vessels (spasm) is followed by their dilatation as a readjustment. In the spasm the state of the endothelium is changed, so when this readjustment comes and the capillaries are dilated, their endothelium becomes permeable and this opens the way for microorganisms. Naturally, since the streptococcus is a quite constant inhabitant of our upper respiratory tract, such upsets in the autonomous nervous system will lead to their permeation through the involved endothelium. The osmosis, of which Dr. Wolf speaks, is observed. At present it is given due attention and is named Eppinger "seröse Entzündung."

Dr. Karl Harpuder (closing): Stimulated by the excellent presentations on therapeutics and perivascular disease, I feel I should stress once more from a theoretical viewpoint: Hyperemia may, but does not necessarily mean increased tissue circulation and improvement of tissue metabolism. Very important recent studies by Rein, a good physiologist, showed that injecting vasodilating substances in the legs of dogs increased the circulation of the muscle. Taking at the same time the mechanogram of the muscle, he found that the efficiency of the muscle was not increased at all, in spite of a definite increase of circulation, of an active hyperemia. He therefore concludes the same as I have from our experiments, that increased circulation does not necessarily mean increased blood supply to the cells, or improved tissue metabolism. This is the problem we are dealing with in peripheral vascular disease, to improve the metabolism and the circulation of the tissues.

Dr. J. Ross Veal (closing): There is only one point I wish to comment upon. Someone asked about the time these pictures were taken. All of these pictures you saw around the knee and leg were made two seconds after the completion of an injection of 22 cc. Of course, the size of the extremity and the length of the extremity and the point that you visualized determines the time. Those you saw were two seconds after the completion of the injection of 22 cc. stabilized sodium dioxide.

Dr. Louis G. Herrmann (closing): I wish to express my deep appreciation to the discussants for bringing up problems which I did not have a chance to mention during the time allotted to me.

I am very grateful to Dr. Kobak for his discussion concerning the origin of the idea for passive vascular exercises. Since efficient apparatus for the application of the alternation of the environmental pressures was actually used in the clinical management of circulatory disturbances more than fifty years ago, there is little justification for any discussion about priority as far as the present generation is concerned. It is an historic fact that the alternation of the environmental pressures has been employed to promote the development of a more efficient collateral arterial circulation in the extremities with occlusive arterial disease in our Vascular Disease Clinic at the Cincinnati General Hospital since July, 1932. During the past five years we have given more than 100,000 hours of this type of treatment.

Dr. Krusen made a real step forward when he designed and built apparatus for his own department of physical therapy, yet I wish to caution you about the absolute necessity of keeping the type of the cycle similar to that which clinical and experimental studies have shown to be physiologically efficient in promoting the development of an increased flow of blood through the collateral arterial pathways. A wide experience with this physical agent "pressure" as a means of increasing the flow of blood through diseased blood vessels of the human extremities has definitely shown that the greatest increase in the arterial circulation and the least damage to the delicate capillaries and arterioles of the affected extremities can best be brought about by the gradual rise and fall, in cyclic sequence, of the pressures about a diseased extremity when the pressure is kept predominantly in the phase below the existing atmospheric pressure.

I mentioned nothing at all about the use of intermittent venous compression because I know so little about it as a practical therapeutic measure. My own interest in these agents for the promotion of better arterial circulation started almost a decade ago because my work as a surgeon brought me into contact with patients in the end stages of arterial insufficiency when there was nothing else to do but add to the constantly increasing number of sacrifices which were being laid at the altar of amputation. It was quite evident to me that all the then existing methods of therapy were relatively ineffective in combating the high-grade arterial insufficiency which came in the wake of obliterative arterial diseases. This was the major stimulus for the work which I have presented to you today. If Dr. Collens has a truly practical method which, as he has stated, has no real contradictions and which is regularly productive of wound healing in the presence of

extensive organic arterial disease, I shall be extremely happy for there are many of these patients who receive little or no relief from all the methods of therapy now in common use.

I do believe that vasodilating drugs should be used in all of these patients. In our own clinics we recommend the use of alcoholic beverages to promote active peripheral vasodilatation since many of the other preparations cost more than our patients can afford. I am convinced that the general care of the extremities with the special protection of the skin of the feet from physical, chemical and thermal trauma is of utmost importance in the management of these disturbances.

I disagree with Dr. Bierman about the expression "Passive Vascular Exercises." This is used to designate a distance variety of alternation of the environmental pressure while the expression "Suction and Pressure Therapy" simply gives one the idea that some attempt has been made to change the environmental pressure but no attention was paid to the degree of the change, the type of alternation, nor the duration of the action of either the suction or the pressure. Many of the failures of this method of therapy in clinical practice today can be laid directly at the door of such inefficient application of this valuable method of treatment. Clinical and experimental studies have convinced us that the cycle and the type of alternation of the pressure are as important to this method of therapy as the skill and experience of a surgeon in the performance of a major surgical operation.

The alkaloids of tobacco are powerful vasoconstrictor substances and I believe that abstinence from the use of tobacco in all forms is essential in the management of all obliterative arterial diseases.

I am very happy to have had this opportunity of discussing these problems before your congress and I trust that I have left with you all the distinct impression that there is no single method of therapy which is universally applicable to all types of obliterative arterial diseases. It is my hope that the presentation of this paper will stimulate a greater interest in all of the conservative methods, for it is the only way that we will be able to offer the most to the unfortunate sufferers of these serious disturbances.

Dr. William S. Collens (closing): It appears obvious that if a major vessel becomes obliterated either by scarring or by encroachment upon the lumen by arteriosclerotic changes, there is little hope of ever re-establishing the patency of that vessel. Clinical improvement can only be anticipated then by the employment of measures outlined to create maximum states of vasodilatation of the collateral circulation.

The question arises regarding the use of methods which will aid in determining the presence of an adequate potential collateral capacity. Although the value of plethysmographic studies and thermometric investigations have been established, these methods are not generally available.

I should like to present a practical clinical test which can be employed as an office procedure. If you should elevate the extremity in which circulatory impairment is suspected and ask the patient to flex and extend the ankle, blanching of the foot will occur. It will also be observed that the veins on the dorsum of the foot will collapse. If the patient then sits up and places the leg in the dependent position, it will be observed that the veins on the dorsum of the foot will fill. Normally, the time that it takes for these veins to fill is 7 seconds. Impairment of the arterial flow will result in a delay of the venous filling time. We have seen retardation in this filling to be fully as great as 60 seconds in patients with profound arterial impairment. These veins cannot fill by the regurgitation of blood from the varicose veins in the leg because of the presence of lunar valves at about the level of the ankle. If you then expose the extremity, under investigation, to mild short wave, in order to elevate the temperature of the deeper structures, maximum states of vasodilatation will be induced. If the venous filling test is then performed, after warming the extremity, a reduction of the rate of venous flow will indicate the role of vasospasm in the circulatory impairment. If there is no change in the venous filling time after warming the tissues and is just as prolonged as in the control observation, one may conclude that the circulatory impairment is extremely profound and is entirely the result of organic obliteration. These latter cases offer the worst prognosis.

With regard to Dr. Krusen's remarks, which I greatly appreciated, we find no necessity for emptying the veno-capillary bed as part of the technic of intermittent venous occlusion. In reviewing the physiology of the venous circulation, one finds that the venous flow, in the direction of the heart, is continuously maintained by the difference in pressure between the capillaries and veins on the one hand and the intrinsic intravenous pressure of the venous system above the diaphragm on the other hand. We have found no difference in our results whether we employed the method of emptying the veins during the resting period or disregarded the veno-capillary bed entirely. The difference we did find, was that creation of anemia, with the limbs in the elevated position, sometimes induced the onset of pain.

I believe that Dr. Herrmann has made an excellent contribution by introducing the use of suction and pressure. I feel that the failures that are occasionally experienced, are the result of improper selection of cases.

EXACT DOSIMETRY IN SHORT WAVE THERAPY

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Translated and modified by *

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For some time there has been felt in the field of short wave therapy the need for a dosimeter, which, instead of registering the high frequency energy in the whole patient circuit, should indicate the measurement of the energy actually applied to, and consumed by the patient. Unfortunately it has not been possible so far to apply the laboratory methods designed for the measurement of high frequency energy to the clinical needs. The electrical properties in the treatment circuit at such high frequencies as 50,000,000 cycles per second (wavelength of 6 m.) are very complicated and even variable under different treatment conditions. This difficulty arises from the physical fact that the size of the treatment circuit is of the same magnitude as the wavelength. Under these circumstances so-called quasi-stationary conditions are obtained, characterized by spatial variations of the energy distribution along the cables, if the properties of the condenser field are altered. This fact precludes any dosage measurements by the application of methods commonly used in high frequency technic.

These discussions, however, are only of academic interest to the clinician. He asks the physicist for an instrument designed for the direct measurement of the short wave energy administered to the patient without difficult theoretical considerations and complicated calculations.

In spite of the difficulties mentioned above certain laboratories succeeded after years of research in developing two dosimeters which fulfill the requirements outlined above. These instruments are technically simple and of sufficient accuracy.

Figure 1 schematically illustrates the first method. At the right of the double pole double throw switch U the dosimeter circuit is shown; to the left of the switch the patient circuit is indicated. The switch connects with the short wave generator through a short cable.

Dosage measurement is performed with this instrument as follows: The double pole double throw switch is thrown to the left, the therapy generator is tuned to resonance in the usual way, and the maximum (resonance) deflection is read on the resonance indicator of the dosimeter. Now the switch is turned to the right, and the two condensers C are varied until the resonance indicator registers the same resonance deflection as before. The rheostat R designed as a special resistance bulb lights up to a certain degree. The intensity of the light is measured by a photoelectric cell F and a galvanometer G, and thus the watt consumption of the resistance is determined. Since both patient and measuring circuits have about the same electrical losses, and, since the capacities exhibit no dielectric losses, the energy consumption of the rheostat R corresponds closely to that of the patient. This was confirmed by numerous control experiments in which the

* The appearance of Mittelmann's paper [Arch. Phys. Ther., X-Ray, Rad. **10**:613 (Oct.) 1937] and its discussion has compelled me to shorten Wenk's contribution and to make other appropriate changes. Contrary to the concept of several participants in this discussion, I am of the opinion that a reasonably accurate measurement of the total energy absorbed by the patient is of prime importance. — A. B.

patient was replaced by an electrolyte phantom, and the energy consumption was determined calorimetrically.

The advantages of this method are:

1. It is independent of wavelengths,
2. One does not have to remove the patient from the condenser field, a procedure which would cause inaccuracies and render the measurement of dosage fallacious,
3. This dosimeter can be attached to all generators which have a tuned treatment circuit, i.e., any commercial short wave apparatus,
4. The measurements have only an error of 6 to 8 per cent.

This method has been tried clinically. It permitted a measurement of dosage in watts in the course of a few minutes.

A second dosimeter of less accuracy was designed, since a high degree of accuracy renders an instrament quite expensive, and does not seem necessary for practical purposes. This simple dosimeter (fig. 2) permits direct

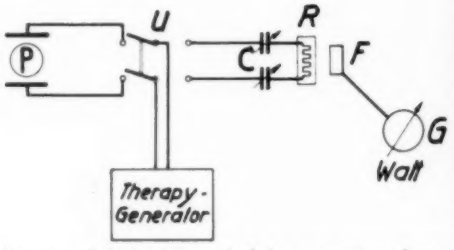


Fig. 1. — Substitution method for measuring short wave energy absorbed in patient.

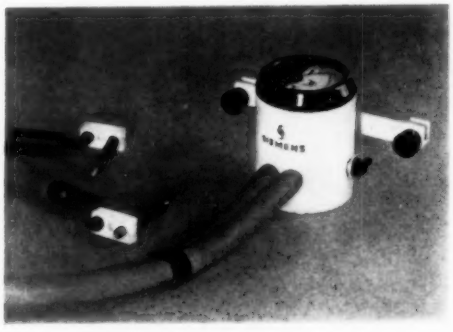


Fig. 2. — Dosimeter.

(momentary) dosage determination on short wave generators with a constant wavelength and a tuned secondary circuit. Fig. 3 (lower part) demon-

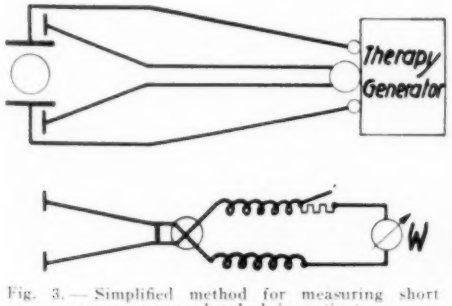


Fig. 3. — Simplified method for measuring short wave energy absorbed in patient.

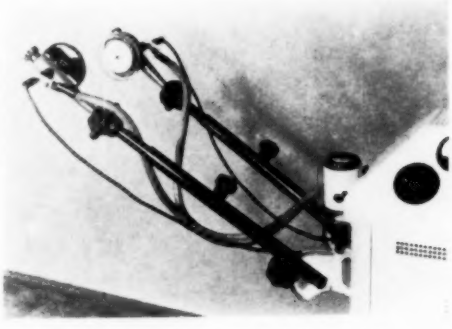


Fig. 4. — Dosimeter attached to generator.

strates the dosimeter schematically and (upper part) its capacitive coupling to the condenser plates. It consists of a shunted thermocross and a measuring device, which registers the electrode potential and which has been standardized calorimetrically in watts. Figure 4 shows its attachment to the therapy generator.

Systematic measurements have proved that the readings of the instrument give an accuracy sufficient for therapeutic purposes. Figure 5 shows

the maximum errors for wide variations of:

1. Conductivity,
2. Electrode distance,
3. Dielectric constant,
4. Phantom size.

The curve represents the standardization at a filament potential of 20 volts, and an electrode diameter of 80 mm. The graph proves that, in spite of wide variations as to the physical characteristics of the phantom, the standardization curve represents the applied energy mostly within a range of only ± 10 per cent.

If the generator permits a variable filament voltage, the standardization curves for the different voltages must be obtained. Figure 6 shows a series

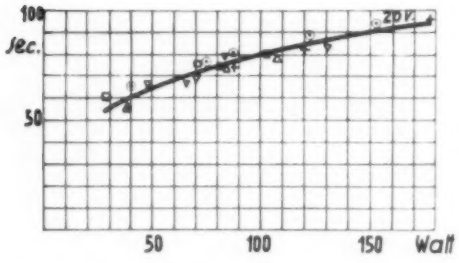


Fig. 5. — Evaluation of sources of error:
1. Conductivity variations
   IK = 6.10^{-3}
   □K = $2,5.10^{-4}$
   VK = 1.10^{-2}
   } 52^{-1} cm^{-1}; $\epsilon = 80$
2. Different electrode distances Δ
3. Change of dielectric constant $\epsilon = 52+$
4. Variation of phantom size ⊙
Diameter of electrodes 80 mm.

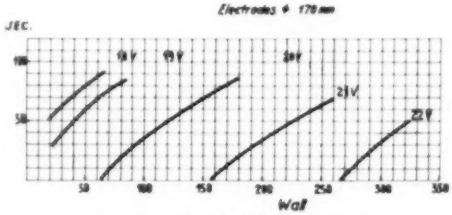


Fig. 6. — Standardization curves.

of curves for filament potentials between 18 and 22 volts, and for an electrode diameter of 170 mm. For different diameters similar groups of curves must be obtained. In applying this method one may assume that the electrical constants (except the resistance) of various biologic objects do not vary excessively. This permits making use of a resultant average conductivity and dielectric constant, composed of various values for different tissues. The correctness of this assumption was proved by comparative measurements with the substitution method.

The following example demonstrates the performance of a measurement:

The filament voltage of a generator tube is regulated to correspond to one of the standard values, e.g., 20 volts, the secondary circuit with the patient in position is tuned for the wavelengths of the generator and the instrument W is read. From the standardization curves (170 mm. diameter) it results that:

60 scale divisions at 18 volts represent 28 watts,
60 scale divisions at 19 volts represent 50 watts,
60 scale divisions at 20 volts represent 135 watts,
60 scale divisions at 21 volts represent 245 watts,
60 scale divisions at 22 volts represent 338 watts.

If electrodes of different size are used the active electrode, i.e., the one

(*Concluded on page 359*)

TREATMENT OF MALE GENITALS BY SHORT WAVE DIATHERMY *

Report on New Technic With Special Electrodes

DAVID DEROW, M.D.

NEW YORK

Among the methods for the alleviation of genital infections, the palliative and even curative properties of heat have been recently exploited by many workers. Among the more recent contributions to this problem mention is made of the application of hyperpyrexia with local hyperthermia in the lower female genitourinary tract for gonorrheal infection and its complications, advocated by Bierman and Horowitz[1]. This technic of combined general and local heating has reduced the average number of treatments from five to one and four-tenths.

Since hyperpyrexia alone is costly, discomforting, and accompanied by risk, this combined technic, by reducing the number of treatments, is most welcome to the patient, curtails the expense and materially diminishes the potential risk of hyperpyrexia. The combined treatment is especially adaptable to the treatment of gonorrhea in women. The very anatomy of the female sex organs lends itself easily to the application of either conductive or conversive heat to the parts most frequently infected, the vagina, urethra, cervix, fallopian tubes and rectum.

The situation is different in the management of gonorrheal infection in the male. The length of the male urethra and its normally low temperature accounts for certain difficulties. The prostate, seminal vesicles and posterior urethra may easily be reached through the rectum with a properly shaped electrode. Although effective heating of the canal may be accomplished by the application of short or ultra-short waves through a suitable electrode, it is not advisable to introduce instruments into a very sensitive and acutely inflamed urethra.

To overcome these difficulties and to develop an effective, safe and painless technic, I have for some time experimented with different methods of applying short and ultra-short wave diathermy to the lower male genitourinary tract.

Technic

The technic may be conveniently discussed under three headings:

1. A new penile electrode and technic for its use in treating the pendulous portion of the urethra.

2. A rectal electrode and technic for its use in treating the prostate and seminal vesicles.

3. Technic of treatment by the combination of the two methods.

1. *Urethral Electrode.* — The penile electrode (fig. 1) was devised to apply short or ultrashort waves to heat the anterior urethra adequately without recourse to intraurethral instrumentation. It is a truncated cone five inches in height, with a base of four and top of two and one-half inches in diameter. It is made of thin sheet metal that will retain its shape and is completely insulated with rubber on its inner and outer aspects. A binding post at the upper third of the electrode serves for connection to the generator. Two rubber flaps are attached at opposite sides to the base of the electrode. These

* From Department of Physical Therapy, Beth Israel Hospital, New York.

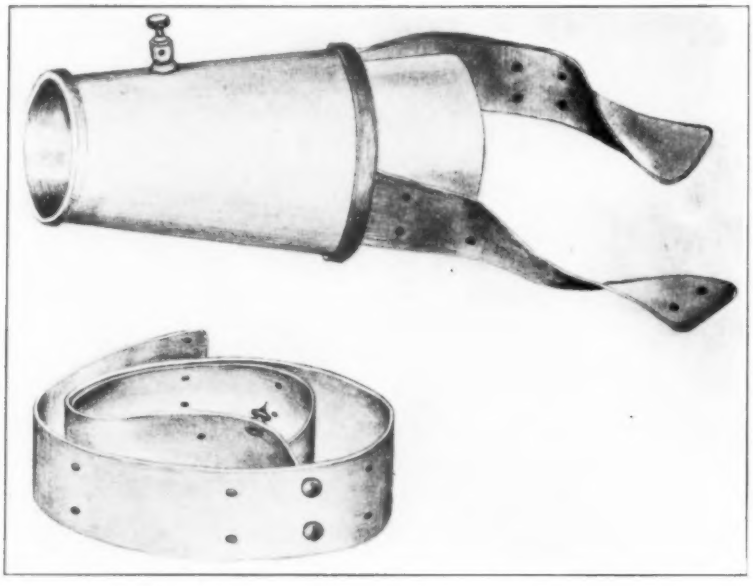
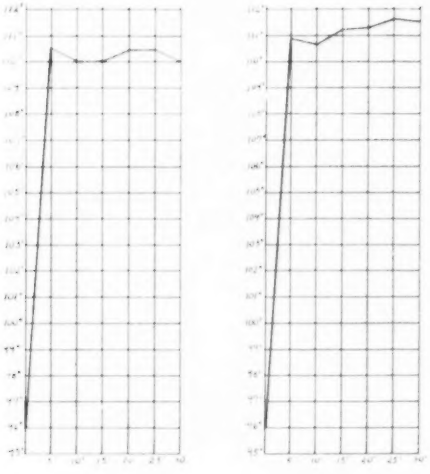


Fig. 1. — Derow short wave penile electrode, cup and strap.

flaps, when fastened with a buckle or other device to a hip strap will hold the electrode securely in place during treatment. A removable hard rubber or bakelite cup fits snugly within the electrode. The cup is sterilized before and after each treatment and is kept in place during treatments to prevent urethral discharge from soiling the electrode*.

The patient is placed in the supine position on a comfortable wooden table. The entire penis is wrapped with a layer of soft paper tissue to absorb any moisture which may cause blistering by the current. The hard rubber or bakelite cup is put on the covered organ and the electrode is placed over it and secured by adjusting a rubber strap around the hips of the patient. The dispersive pad electrode attached to one binding post may be placed under the buttocks or under the table when a short or ultrashort wave generator, respectively, is used. After connecting the penile electrode to the other binding post of the generator the current is turned on. The manner of introducing the high frequency current will depend upon the particular apparatus used. In the "Fishertherm" (6-meter) the meter has a range of from zero to 500 ma. The current is increased until the meter registers 200 ma. and then at regular five minute intervals the current is increased until the desired temperature is reached. After the lapse of ten minutes when the temperature would invariably drop, more current is introduced in order to maintain a steady temperature for the duration of the treatment. In the experimental work with chronic cases I have kept a suitable thermometer in the urethra to record the temperature during the treatment, and have found no untoward effects. There is usually a drop in temperature of two to three degrees as soon as the current is turned off. Chart 1 *A* shows the record of a single treatment given with the penile electrode. Temperature readings were made from a thermometer in the urethra. The average temperature readings in thirty-six treatments given with the same technic (chart 1 *B*) show an abrupt rise of the urethral temperature from 95 to 110.8 F. in five minutes. There is a slight rise to 111 during the next twenty minutes, and a small drop to 110.5 F. during the last five minutes. When

* Note:—This electrode was made for me by J. Beeber Company.



A B

Chart 1. — *A*, urethral temperature curve of one treatment; *B*, average urethral temperature of 36 treatments.

different depths of the urethra were tested by keeping the thermometer fixed at two, three, four and five inches from the meatus, very little variation in temperature was observed. It is evident that uniform and adequate heating of the anterior urethra is achieved by this technic.

2. *Prostatic Electrode.* — This instrument (fig. 2) consists of a body, neck and stem, whose respective lengths are 2⅜, 2⅜ and 6¼ inches. The neck and stem are made of brass tubing that conducts the current to the body or active part. The body is made of metal, flattened, concave on its anterior surface, convex posteriorly, and tapers to a rounded tip which is insulated. The tapering end facilitates introduction of the instrument, while its insulation prevents concentration of the current at the tip; the anterior concave surface fits snugly the rounded surface of the prostate to which the electrode is applied. A bulge at each end of the neck prevents the appliance from moving up or down during the treatment. The narrow neck between the bulges is 1⅝ inches long and ⅝ inch in diameter. This narrow neck lessens anal irritation. From the posterior aspect of the distal bulge protrude two tubes that serve for the attachment of rubber hose and the circulation of water through the body of the electrode.* Thus "filtered heat" may be applied by circulating hot or cold water through the electrode during a diathermy or short wave treatment. Hot water is used when superficial heating is desired and cold water when deep heating is desired. The anterior and posterior surfaces of the stem are fenestrated in the distal half to within one-half inch of the end. This enables one to make readings of the temperature when the patient is either in the supine or the prone position. A suitable cap that covers the free end of the stem prevents the ther-

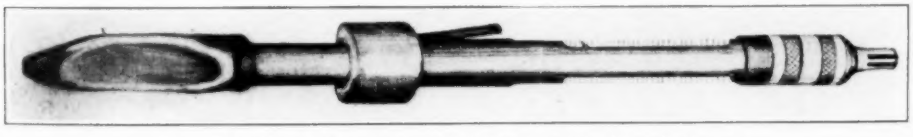


Fig. 2. — Derow water circulating prostatic electrode.*

* This electrode which I have found convenient and useful was made for me by the Garshelis Laboratories.

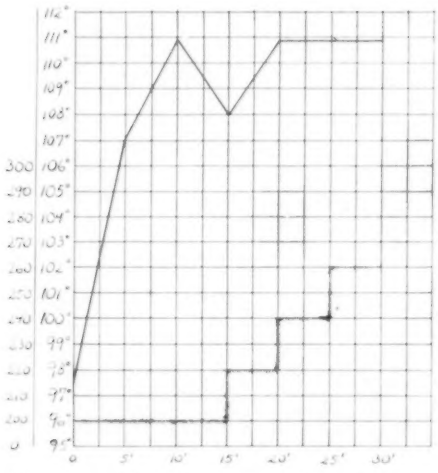


Chart 2. — Effect of staircase method of current introduction on temperature (— = urethral temperature; mmm = current).

mometer from dropping and holds the lead securely. With the exception of the cap and the active part of the body the electrode is insulated with hard rubber or bakelite. The body is made in three-quarters of an inch, seven-eights of an inch, and one inch widths. The overall length of the three sizes with cap in place is thirteen inches.

The technic for the application of short or ultra-short wave diathermy to the prostate and adjacent structures is simple. The patient is placed on a wooden table in a prone or supine position. The prostatic electrode with thermometer inside is well lubricated and inserted into the rectum. Any surplus of lubricant is wiped off the anal region to prevent burning sensations or subsequent blistering by the current through heating of the moisture. The dispersive pad electrode connected to one binding post of the generator is placed either on the lower part of the abdomen or on the lower back. The active prostatic electrode is connected to the other binding post of the short wave generator by a cord, the length of which is chosen according to the intensity of heating. A twenty-five inch cord serves best in most cases. However, if it is inconvenient to use so short a cord, a longer one may be used without loss of control by interposing a variable condenser between the prostatic electrode and the short wave generator. The ultrashort wave generator is turned on, and adjusted to emit 200 ma. After a lapse of approximately ten minutes additional current must be introduced to avoid a temperature drop that otherwise would invariably occur. As with diathermy, the required temperature may be maintained by increasing the strength of the current at regular intervals. Chart 2 shows that with a constant output of 200 ma. the temperature in the prostatic electrode rises to about 107 F. in five minutes, to about 111 in ten minutes, and then falls off to about 108 F. Upon increasing the output of the machine at regular intervals, the temperature is restored to 111 F. at which level it may be maintained as long as desired. The duration of the treatment is usually thirty minutes, but I have extended treatments as long as two hours without any apparent ill effects. In subacute and chronic inflammations of the prostate and vesicles I have found the combination of ultrashort wave and the sinusoidal current to have the advantage of producing a simultaneous heat and massage effect. The only additional apparatus necessary is some form of resistnce between the ultrashort wave generator and the sinusoidal machine, to prevent the

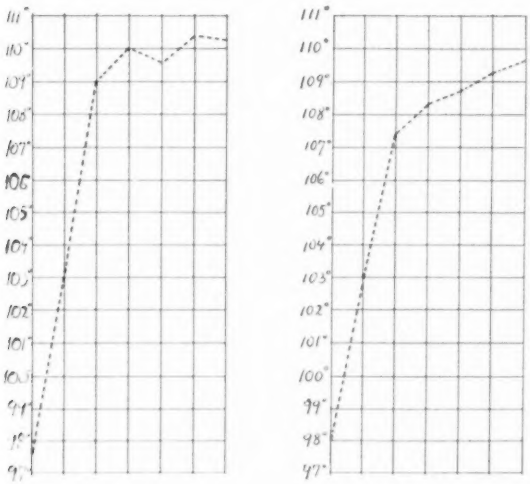


Chart 3. — *A*, temperature curve of one prostatic treatment; *B*, average temperature curve of 59 prostatic treatments (- - - = prostatic electrode temperature).

high frequency current from surging into the sinusoidal machine and burning it out.

In 59 treatments given with the above technic temperature readings were made from the thermometer in the prostatic electrode (chart 3 *B*). The averages show an abrupt rise in the prostatic temperature from 98 to 107.3 F. in ten minutes, followed by a gradual increase to 109.6 F. during the next twenty minutes, at the end of which period the treatments were terminated.

3. *Combination Technic.* — To administer ultra short wave to the prostate, seminal vesicles and anterior urethra simultaneously, the patient and penile electrode are arranged in exactly the same way as described above, but in place of an indifferent pad electrode, the prostatic electrode is introduced into the rectum (fig. 3). In this combination method the length of the lead from each electrode to the machine is very important, as variation of these

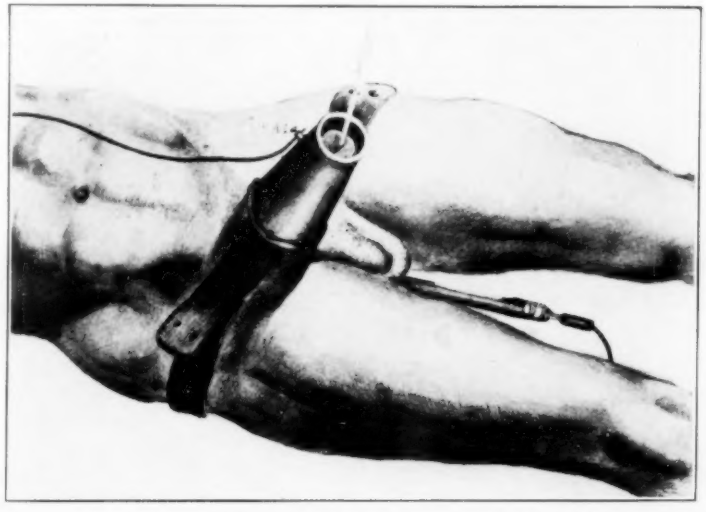


Fig. 3. — Derow penile and prostatic electrodes in position.

lengths enables one to produce any desired temperature in the rectum or urethra independently (chart 4). With a 6-meter machine, a 35 inch cord to the penile electrode and a 25 inch cord to the prostatic electrode were found to give equal temperatures in urethra and rectum during a treatment. However, if it is desired to have a higher temperature in the urethra than in the rectum, it may be accomplished by shortening the cord to the rectal electrode; by using a smaller penile electrode, or by introducing a variable condenser in the cords. The fingers of the patient may be used when applied to the outside of the penile electrode to draw some of the current from it, thereby lowering the temperature of the urethra.

There is a definite relationship between the prostatic and urethral temperatures with the combined technic. Consequently in acute urethritis it is unnecessary and inadvisable to introduce a thermometer into the inflamed and sensitive urethra. In a series of 230 treatments given with the combined technic, the average temperatures of the urethra and rectum (chart 5 *B*) run almost parallel. There is a slight delay in the rise of the rectal

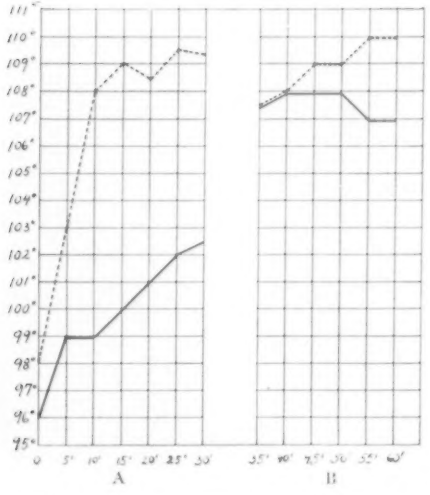


Chart 4. — *A*, temperature curves with 37½ inch and 28 inch cords; *B*, temperature curves with 52 inch and 28 inch cords (- - - - - - - - - = prostatic electrode temperature, — = urethral temperature).

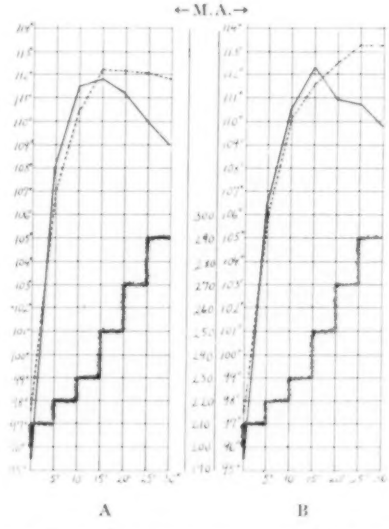


Chart 5. — *A*, temperature curves of one combined treatment; *B*, average temperature curves of 230 combined (▭ = current; - - - - - - - = prostatic treatment; — = urethral temperature).

temperature in the first five minutes (most likely due to the longer time required to heat the mass of metal in the prostatic electrode), and the rectal temperature ultimately attains a higher level. This last phenomenon is probably due to the activity of the thermo-control and vasomotor centers. It is evident that for practical purposes the urethral temperature m y be estimated with fair accuracy by observing the rectal temperature. The effect of these treatments on the body temperature, pulse and respiration is the same as that of similar treatments given with long wave diathermy.

The following experiment was performed to prove that the temperature readings were not condenser effects of the mercury in the bulb of the thermometer. After taking the urethral temperature of the patient, which was 97 F. the thermometer was removed and a regular thirty minute treatment was administered with the penile and prostatic electrodes. At the end of the treatment a thermometer was quickly inserted into the urethra. The temperature recorded was 108.8 F. Since the thermometer was not influenced

by the electromagnetic field, the reading represented the correct temperature of the urethra. In fact, the temperature during the treatment must have been higher because it is known that there is an immediate drop of two to three degrees as soon as the machine is turned off.

According to the clinical observations it is my impression that the last described method of heating the lower male genito-urinary tract, alone or combined with general hyperpyrexia, chemotherapy, or both, may prove as effective in reducing the number of treatments necessary for a complete cure as it has proved in the female. By this combined technic it is possible to apply adequate and effective heating to all foci of infection from the meatus to the seminal vesicles without instrumentation or irritation of the sensitive, inflamed urethra — a technic that has been sought by many physicians interested in the treatment of gonorrhea and its complications.

Summary

1. New instruments are described for the application of short and ultrashort wave diathermy to the lower male genito-urinary tract.

2. Adequate and effective heating of the pendulous portion of the urethra may be achieved without intraurethral instrumentation.

3. A combined technic is given that makes possible the simultaneous treatment of all foci of infection.

17 West 9th Street.

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Dosimetry — Wenk and Bachem

(Continued from page 352)

nearer to the patient, determines the group of standardization curves to be used.

With these two methods one is now enabled to measure short wave energy application objectively, while so far the physician had to depend mainly on the subjective heat sensations of the patient.

The solution of the problem of measuring the short wave energy actually applied to the patiént places short wave dosage on a scientific foundation and allows the standardization and reproduction of short wave treatments.

RADIUM THERAPY IN BENIGN CONDITIONS OF NOSE AND THROAT *

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NEW YORK

The medical use of radium is no longer a matter of conjecture. Due to the efforts of technicians as well as practitioners we are rapidly approaching an absolute technic in the application of this agent.

Malignancy of the upper air passages is not encountered often enough in clinical practice to be considered as everyday work, but the knowledge we have gained in its treatment has been of practical value in the management of the common benign lesions. In such conditions of the nose, especially nasal hemorrhage and recurrent polypoid growths, radium has proved beneficial. It has been used successfully also in the control of inoperable tonsils, angioma of the larynx, rhinoscleroma, ozena, tubercular glands, and fibroma of the pharynx.

Persistent nasal hemorrhage is indicative of a grave systemic condition in the majority of cases. Except those isolated cases in which trauma or other external influence is the cause or the nose bleeds are ascribable to hemophilia, there are certain patients whose persistent nasal bleeding can be attributed to a definite local defect in the structure of certain vessels.

Upon the lower anterior surface of the nasal septum we find an area of limited extent, known to rhinologists as Kiesselbach's space. Inspection of this area shows it tto be rich in tiny capillaries which stand out prominently beneath the mucous membrane, and this is the site of most of the nasal bleeding.

Nasal Hemorrhage

It is now more than ten years since it occurred to me that radium might be employed to reduce or totally obliterate the vessels in that space. The action of radium emanation in disintegrating the structure of the cells making up the walls of blood vessels is well known. This cell destruction is followed by fibrosis, and secondary proliferation of connective tissue. It seemed reasonable, therefore, that patients suffering from idiopathic bleeding from Kiesselbach's space would be permanently relieved by suitable radium applications.

This therapy was first tried on patients who had suffered for years from excessive nasal hemorrhage, had their nares packed and the mucous membrane cauterized repeatedly in peristent but unsuccessful attempts to control the bleeding. The treatment was successful in virtually every instance. A few of the earlier patients returned with slight recurrence of the hemorrhage but examination revealed that the blood was coming from some section of the vascular area which had not received adequate radiation at the initial treatment. Applications to this previously neglected surface permanently closed the leaking vessels. In the most severe cases inspection several months after radium treatment showed the site of application covered with dry crusts. The patients usually found this encrusted condition rather annoying, but all deemed it far preferable to the continual menace of nose bleed.

* Read at the Sixteenth Annual Session of the American Congress of Physical Therapy, Cincinnati, Ohio, September 21, 1937.

The technic is simple. Equal parts of one per cent nupercaine and epinephrine solution are used to anesthetize the nasal mucous membrane and to induce sufficient shrinkage to permit easy access for the radium applicator. This applicator is a capsule made of platinum 1 mm. thick, and contains 25 milligrams of radium element. The platinum capsule is encased in thick gutta percha dental tissue and after being well lubricated is placed on the floor of the nose in line with Kiesselbach's space. The eye provided at the end of the platinum capsule serves to hold a strong thread, which is carried to the nasal opening and held in place by a strip of adhesive plaster.

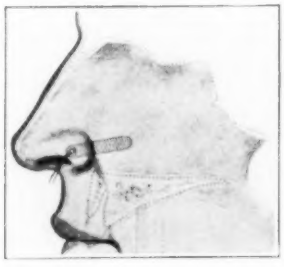

Fig. 1. — Diagram showing radium element in its brass container applied against the septum.

Fig. 2. — Diagram showing the brass capsule containing the radium encased in dental gutta-percha tissue traced by a wooden applicator, secured by a thread through the eye in the tube and fastened to the ear.

A four-hour application of this radium capsule gives an irradiation equal to 100 millicurie hours. In most cases this single application suffices to obliterate the most prominent vessels and induce a fibrosis which will permanently end nasal hemorrhage on the treated side. Bilateral cases may require two treatments and in a few instances, as already mentioned, where we have failed to reach all the bleeding vessels a second application has been necessary. In no instance has the treatment failed to give immediat relief, nor has there been further recurrence after the second treatment. In but few cases has there been the slightest radium reaction. Considerably more than a hundred patients have been treated in this way, so that I feel justified in stating that persistent nasal hemorrhage can be cured by radium.

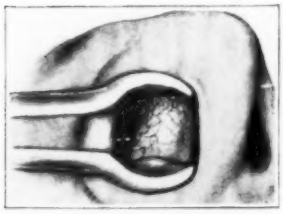

Fig. 3. — Septum before application of radium showing exposed and tortuous vessels.

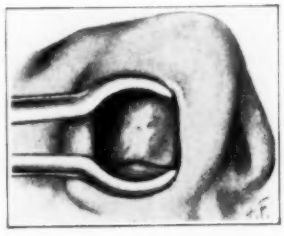

Fig. 4. — Septum after application of radium showing obliteration of blood vessels.

Fig. 5. — Technic of radon implantation.

Nasal Polyps

The care of patients subject to nasal polyp formation has long been one of the most vexatious and unsatisfactory features of rhinologic practice. The etiology of these growths has baffled the most experienced pathologists, and their persistent recurrence after removal by operative procedure has balked the efforts of the best rhinologic surgeons.

Early in the history of radium therapy efforts were made to eradicate nasal polypi by its use, but the results were so unsatisfactory that the attempts were abandoned. In some of the early cases adjacent structures were damaged, even destruction of the optic nerve having been reported. As nasal polypi are not dangerous to life such risks could not be taken. Radium has never been able to compete with surgery in the treatment of this particular growth. Surgical methods have continued to be the only ones which are satisfactory, though with these recurrence has been the rule rather than the exception.

At present the most acceptable treatment of nasal polypi is a combination of surgical removal with postoperative irradiation of the base. This method was instituted at my clinic as early as in 1924, and has been continued up to the present time as the only means of adequate treatment of this annoying nasal condition. If the underlying cause of polyp formation can be determined, this should be treated first and, if possible, eradicated. When such preliminaries are disposed of, the nostrils are anesthetized with equal parts of ten per cent cocaine and epinephrine, applied to the mucous membrane for ten minutes and followed by the injection of two per cent procaine hydrochloride and epinephrine into the ethmoid region and behind the middle turbinate. As soon as the operative field is thoroughly anesthetized, the accessible polypi are snared off, and those which the snare cannot reach are removed by forceps. If the polypoid condition has extended into the ethmoid (or possibly has originated there), it will usually be necessary to undertake the exenteration of that sinus. Sometimes part of the middle turbinate will have to be destroyed also; or in the event of involvement of the antrum, part of the lateral wall of the nares must be removed so as to establish good drainage of the maxillary antrum. Such extensive intervention is not required in the majority of polyp cases. Where the growths are readily accessible through the nostrils, the snaring off will cause but little bleeding, and any slight oozing can be controlled by electrocoagulation.

As soon as recovery from the surgical procedure is complete (ordinarily after three or four days) the radium applications may be begun. A capsule similar to that above described is employed. Twenty-five milligrams of radium element allowed to remain in the nares four hours, is the amount commonly administered. Two such applications to each side are recommended.

The applicator is laid in the nares directly against the site from which the polyp has been removed. A tapering cotton tampon reinforced by a wooden applicator, holds it high up in the nostril. A strong thread is attached to the platinum casing through the loop provided for this purpose. This thread is fastened outside the nose, so that there can be no possibility of the radium container becoming loosened and slipping down the patient's throat. Tubes of radium emanation (radon) may also be used for this work, the amount of radon and the time of exposure being measured to deliver a total of 100 to 200 millicurie hours.

After a week's interval a second radiation is given. There is seldom recurrence in patients so treated. In the few cases where polypi have reappeared, they were much smaller and more fibrous than the original ones, and were always readily removed. The radium treatment also has a curative effect upon postoperative congestion, promotes healing and results in a roomier nose.

Tonsils

While surgery still remains the best means of removing diseased tonsils, in cases where operation is refused, or is for any reason impossible, the implantation of radon seeds has supplied a satisfactory substitute. This work was undertaken almost fifteen years ago. Needles were used in the first few cases, but with the introduction of the removable platinum radon seed this applicator was substituted, and has proved most satisfactory. The method is not intended to supplant tonsillectomy, but only as an alternative where operation is contraindicated or refused. It is not successful in cases of long-standing, chronic diseased tonsils, for recurring attacks of inflammation eventually change the character of the tissue affected, so that instead of being lymphoid it becomes largely fibrous. Lymphoid tissue is known to be highly radio-sensitive. If a normal tonsil be implanted with a single radon seed it quickly atrophies and shrinks to a mere fraction of its original size, but where the patient has suffered recurring attacks of tonsillitis for many years radio resistant fibrosis takes place. Implantation with radon seeds affects only those portions of the tonsil which remain truly lymphoid in structure, and has little or no effect on the old hardened fibrous tonsil.

The technic consists in implanting one, two or occasionally three seeds in the hypertrophied tonsillar tissue. In the majority of cases a single seed is sufficient to induce regression of the mass within a few weeks. A three-millicurie removable radon seed will act effectively upon four cubic centimeters of tonsillar tissue. Left in position four or five days it delivers a dosage of about 200 millicurie hours. As the average tonsil is about 2 cm. in diameter, this limits the action of the seed quite closely to the lymphoid tissue, structures outside the capsule of the tonsil being left unradiated.

Not the least of the advantages offered by radon implantation in the treatment of diseased tonsils is the avoidance of anesthesia and hospitalization. The insertion of the seeds causes so little trauma that only the most nervous patients need any sedative while the treatment is being given. The threads attached to the seeds are cut off after insertion so that just enough is left to permit the forceps to grasp it at the time of the seed's removal. This is so short that it does not interfere with deglutition. The patient can eat and drink as usual, and does not experience the slightest inconvenience. With skill in implantation the seeds should not become

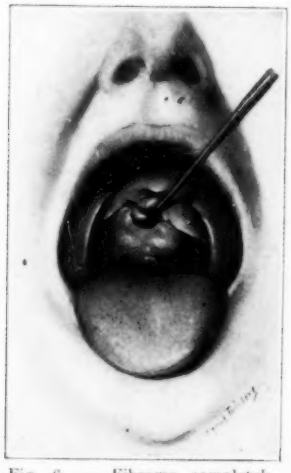

Fig. 6. — Fibroma completely occupies the pharynx.

Fig. 7. — Total disappearance of mass.

loosened, but in the few instances where they have been so loosened and have been swallowed by the patient, there have been absolutely no bad results. I myself had my throat so treated and swallowed two seeds which were still active, but did not at any time suffer the slightest inconvenience from the mishap.

The use of removable platinum radon seeds has made possible the eradication of many diseased tonsils which would otherwise have gone wholly untreated, or at least have had inadequate and unsatisfactory therapy. Where the tonsil is the focus of infection which is reacting upon the entire system, such therapy becomes of major importance, and may even prove life saving. It is earnestly recommended in all cases where surgery cannot be employed.

Special Lesions

Nasal pharyngeal tumors which are usually benign may suddenly become malignant changing from a fibroma into a fibrosarcoma. They grow rapidly and produce mechanical obstruction and are often inaccessible to surgery. They bleed profusely and return readily. Treatment for this condition is radium in the form of removable seeds which are implanted equidistant around the base of the growth and are allowed to remain in situ eight to ten days. They are then removed by the attached strings.

The tumor usually shrinks in size and there is considerable sloughing so that at the end of one week the tumor base becomes visible.

Papillomas of the cheek, tongue and tonsils, though benign, often tend towards malignancy. They should be removed by radium combined with surgery or electrocoagulation.

Fig. 8. — Tonsils before treatment with radium.

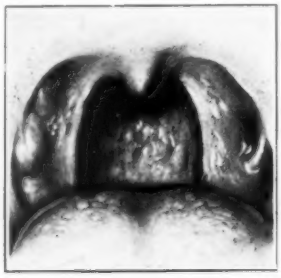

Fig. 9. — Tonsils 6 months after treatment with radium.

Follicular tonsillitis has been treated with radium. While such treatment seems absurd, Dr. Laura Lane reported a case in which a 10 mg. platinum needle inserted into each tonsil for three hours, resulted in immediate improvement. The next day the inflammation had subsided, the tonsils appeared less inflamed and less painful, the temperature disappeared and swallowing was less difficult.

Angiomas of the larynx are very rare, appearing in small pedunculated masses at almost any location. Radium in the form of removable seeds immediately obliterates this condition. Angiomas elsewhere in the nose or throat respond satisfactorily to radium therapy and should be the method of choice.

Papilloma of the larynx is a benign self-limiting condition and is only mentioned to condemn the use of radium in this lesion.

Tubercular glands are often benefited by radium therapy. Radium properly screened and applied causes a shrinkage of the tubercular gland, some

disappearing entirely and others remaining as a fibrous nodule. The action is due to the change of the cellular structure of the gland into a fibrosis. Treatment consists in applying 300 to 1,000 millicurie hours radiation to be repeated monthly until the gland is completely atrophied.

Rhinoscleroma is a benign condition thought to be due to a specific organism. The nasal mucosa is chiefly involved, the tumefaction consisting of granulomatous tissue which gives the nose a red, bulbous and telangiectatic unsightly appearance and obstructs the nasal orifice. Surgery is unsatisfactory and radium has been reported to have produced good results.

Rhinophyma is a chronic affection of the nose involving the submucous glands which become enlarged and dilated, giving the nose an unsightly appearance. Radium therapy has not been very satisfactory.

Ozena is a bilateral disease of the nose characterized by atrophy of the nasal mucous membrane and bony structures, with a secretion of thick mucous which when dried forms foul smelling scabs. While radium has a destructive action in moderate doses it is also stimulative in small doses. When so applied (100 to 200 millicurie-hour dosage) it has proved of great benefit in many cases in the hands of several authors. I have treated a number of ozena cases with radium, but the results were such that the treatment has been abandoned.

In conclusion, I would emphasize the importance of radium as a part of the rhinolaryngologist's equipment. Though this is far better appreciated now than a few years ago, I feel that much more can be accomplished when practitioners of this specialty shall more fully realize its value.

27 West 96th Street.

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(Discussions of this paper will be published in a future issue.)

SCIENCE, NEWS, COMMENTS

Professor d'Arsonval Honored by French Academy

The French medical profession will on the seventh day of this month again pay homage to the master electrophysiologist, Professor Arsène d'Arsonval, on the occasion of the semi-centenary of his election to the French Academy of Medicine. It so happens that the ceremonies to be held by this learned body coincide with the master's eighty-eighth anniversary.

Among the features of the program we mention a special address of eulogy by the President of the Academy, Professor Bezançon, a discourse by Professor Strohl, who occupies the chair of physiobiology, the presentation of a special medal struck for the occasion to the grand old man of science, and, finally, an expression of acceptance of the medal and appreciation of the evidence of admiration rendered him in such a tangible manner by the master himself.

A suitable cablegram of felicitation both to the jubilarian and the French Academy of Medicine has been sent by the Congress, as we are sure that each and every member and each and every reader of the ARCHIVES rejoices in the realization that Professor d'Arsonval, to whose genius the scientific world owes so much, has lived long enough to see the splendid fruits of his labors and to know the esteem in which he is held not only by his own countrymen and confreres but by the entire civilized world.

May the young-old jubilarian remain many more years with us to enjoy the spiritual reward of this great work in the cause of humanity!

Meeting Radiological Society

The twenty-fourth annual meeting of the Radiological Society of North America will be held in Pittsburgh, Penna., November 28th to December 2nd at the Hotel William Penn.

Cancer-Causing Chemicals Induce Tumors in Plants

Chemicals that produce cancer in man and animals also cause abnormal tissue growths when applied to plants, Dr. Michael Levine of Montefiore Hospital, New York City, told the meeting of the American Botanical Society.

Dr. Levine used a number of substances, including the well-known cancer-provoking coal tar and compounds containing the "sulfhydril" group, claimed by some physiologists to be especially liable to cause abnormal cell formation. He applied them to the growing tips of a considerable variety of plants, both annuals and perennials.

Young sunflower plants thus treated grew crooked stems, the spaces between the leaves were shortened, many small branches were formed producing a "witch's broom" effect. Injured or injected stems painted with chemicals or treated with powdered forms of these agents produced swellings with small tumor-like growths.

Under the microscope, these abnormal growths displayed certain cancer-like appearances, but of the simplest type. The plant tissues did not remain permanently cancerous, but developed the characteristics of mature tissue and stopped their wild undirected growth.

Annual plants seemed most responsive to the cancer-provoking agents. Perennials reacted far less and recovered sooner. Compounds containing the "sulfhydril" chemical group did not appear to be more effective than the other chemicals in producing the overgrowths. — *Science News Letter.*

Trench Mouth Increase Traced to Dirty Glasses

An increase in trench mouth and possibly other serious diseases was laid at the doors of taverns and eating establishments serving alcoholic beverages by Dr. Don Chalmers Lyons of Jackson, Mich.

The increase in these diseases has probably occurred because beverage dispensing establishments are not using proper methods of cleaning their glasses, Dr. Lyons charged in a report to the Society of American Bacteriologists.

He found large percentages of the trench mouth organism and other disease "germs" on the rims of glasses racked on the bar and ready for use and also on glasses rinsed after their return from the customers.

The findings of this study and of a similar one by Drs. W. L. Mallman and W. L. Chandler of the Michigan State College suggest, said Dr. Lyons, "the necessity of better control of methods of glassware cleansing in such establishments." — *Science News Letter.*

Home Better Than Institution for Protecting Child from TB

A child can be better protected from tuberculosis by proper care in his own home than by spending a few months or a year in a preventorium. A study supporting this view was presented by Dr. Lewis J. Moorman of Oklahoma City at the meeting of the National Tuberculosis Association.

Figures from 18 years' experience at the Oklahoma City Tuberculosis Dispensary were cited by Dr. Moorman. During this period 1,156 children who would be considered eligible for preventorium admission were allowed to remain at home but were taught how to take care of themselves to avoid development of the active disease

(Concluded on page 374)

ARCHIVES of PHYSICAL THERAPY
OFFICIAL PUBLICATION AMERICAN CONGRESS OF PHYSICAL THERAPY

.·. EDITORIALS .·.

BASIS OF FANGO THERAPY

Recognition that controlled external temperatures exerted definite physiologic effects of benefit in varied pathologic processes has resulted in a modern renaissance of its therapeutic use. Born in antiquity and carried through the ages like a therapeutic vestal torch, its empirical practice by both its ancient and recent advocates rested on no more solid a criterion than faith, hope and experience. The uniform and continuous impressions of the clinical benefits derived from dry, moist or liquid material found in thermal sources unquestionably were responsible for its persistent use between the Hippocratean and modern eras of medical practice. Hippocrates regarded heat and fire as the last therapeutic resource, and modern medicine is now indicating a reawakened appreciation of the clinical possibilities of thermotherapy by suggesting its employment in the forefront of its remedials for defense of health and offense in disease.

Dismissing faith from our consideration and placing reliance on experience, unquestionable benefits must be attributed to the therapeutic use of natural resources typified by hot mineral springs and mud cataplasms secured from certain regions. Among these, hot fango taken from volcanic lakes has since antiquity challenged attention because of its therapeutic effectiveness. Ignoring the views expressed by the ancients as part of an obsolete but interesting era in medicine, its present renaissance is to be credited to the scientific efforts of a number of workers who have critically investigated the physiologic action and therapeutic merits of certain moors or clays. Thus within the past few decades it has been established that the application of hot hydromineral mud brings about osmotic changes in a manner to remove congestion in deep seated organs through dilatation of the lymph and blood vessels (Balme[1]). On the basis of its deep hyperemic action, Behrend[2] has confirmed clinically the effectiveness of fango packs in causing rapid absorption of effusion, relief of pain and increase of mobility of partially ankylosed joints.

Berlin[3] has shown that the application of mud causes leukocyte changes which take the course of a double-phased reaction. The first is that of neutropenia with absolute lymphocytosis, while the second phase, which appears after four to five hours, takes the form of neutrophilia and a displacement to the left. This author found that while the erythrocytes and the hemoglobin manifest no changes during the first few hours, there is a decided increase in the red cells and the hemoglobin about five hours after an application. While appreciating the rather limited value of the opsonic index, it is nevertheless of decided interest to point out that it has been increased after the application of mud packs in contrast to the negligible influence observed with other forms of heat. Berlin reaches the conclusion that the heat factor does not play the most important role in the effectiveness of mud packs since their physiologic action differs from that of other thermal agents. His observations have led to the concept that these applications exert a peculiar influence on the vegetative nervous system which in part explains the effect on the morphologic composition of the blood. It also appears that the autonomic system has a decided effect on cutaneous allergy, which in turn causes increased metabolism marked by excessive cellular decomposition.

It is but natural that the observation of favorable results of pelotherapy has caused considerable speculation regarding the underlying reasons for its clinical action. Analysis of fango mud having shown it to contain a number of minerals, it was assumed by some that these played a role in the therapy. Others again have theoretically predicated its action on the basis of radioactivity. All these theories are of lesser importance than the physical properties of this agent, because its moisture and plasticity combined with moderate heat of low conductivity must of necessity act not only as a cataplasm in the sense of topical sedation but induce deep hyperemia. Accordingly there appears to be no need for searching in pelotherapy occult or mysterious powers when in the light of present-day knowledge we have a sound physiologic basis to explain the therapeutic effects of fango applications in a large variety of inflammatory, exudative and painful conditions.

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PHYSICAL THERAPY SEMINAR OF CONGRESS

The last postgraduate or pre-convention instruction in physical therapy sponsored by the Congress was held at the Kansas City meeting in 1935. It evoked such spontaneous, favorable comment that continued demand has made it advisable to duplicate this seminar course under more experienced auspices. Since its conclusion the Board of Governors have been urged by members and other physicians to hold another course, but it was not deemed practical to conduct a seminar either at the New York or the Cincinnati meeting. It finally was decided to afford those desiring to perfect themselves in the various branches of physical therapy an intensive seminar, which will be held throughout the four days preceding the sessions, namely September 7, 8, 9 and 10.

Attention is invited to the fact that the attendance has been limited, and as already many applications have reached the Executive Director those who plan taking this year's course should not delay filing a request by letter when further directions will be mailed to each applicant. The course is open to ethical physicians, irrespective whether they are members of the Congress or not, and to technicians who possess the necessary qualifications to benefit from the special postgraduate instruction.

Since the last seminar physical therapy has progressed both theoretically and clinically to a great extent, and it is the intention of the carefully selected corps of lecturers and demonstrators to present a thorough review of all advances in our discipline. Thus the newest developments of short wave diathermy, physical hyperpyrexia, electrodiagnostics, galvano- and faradotherapy, the indications and use of infra-red, ultraviolet and other means of radiotherapy will be discussed and demonstrated in a practical manner. Special lectures and demonstrations on massage and exercise will stress their indications and methods of application. A number of specialistic surgeons who have made extensive use of the high frequency currents both in general and special surgery will present the indications and technics of this very valuable addition to minor and major surgery.

It is impossible in this brief announcement to present an adequate idea of the extent of the program that has been arranged for the four-day intensive seminar. Suffice it to say that much thought has been given to the practical every-day needs of practitioners interested in obtaining the best possible therapeutic results from every available physical measure, without at the same time neglecting the scientific fundamentals required for a thorough understanding of the theory and practice of physical therapy.

With the clinical and material facilities available in Chicago, and with lecturers selected from men of acknowledged scientific attainments who have had long experience as teachers in medical colleges, the 1938 seminar should prove a most valuable post-graduate course. Again we urge all interested individuals not to delay forwarding their applications for the course as the number of participants must be limited in order to insure informal contact between the teaching body and the audience. It is therefore urgently suggested that early reservations be made by those who are desirous to benefit most fully from the experiences of the most authoritative group gathered for this purpose.

CORRESPONDENCE

Dispute Re: Chromotherapy

To the Editor: In reference to the review on my book: "Elements of Chromotherapy," which appeared in your April issue, I am just a little doubtful as to whether you really mean your readers, including myself, to take you seriously or not. If the latter be the case, then surely I must be singularly lacking in a sense of humour; if the former, then you have succeeded in your obvious intention of drawing a reply from me.

Let me state at the outset that both myself and my co-workers are heartily in accord with the sentiments you express in regard to the damage done by unscrupulous and unqualified practitioners to physiotherapy in general and to chromotherapy in particular. Sir Humphrey Rolleston recently remarked that if any branch of medicine was avoided by the well-educated practitioner, the door was left temptingly open for the charlatan. May I suggest, my dear Editor, that you can scarcely expect to further the cause of science by barely-veiled insinuations that all serious-minded investigators into the therapeutics of chromotherapy are "charlatans" and "border-line practitioners"!

The distinguished actinologist, to whom you refer as an "orthopaedic surgeon" might, I think, have been left immune from your spiteful attack. The libellous implication that such an eminent authority would descend to "write-up" a medical text-book for sale purposes, even if your intention was merely to be humorous, is in the worst possible taste and not at all likely to be appreciated by European readers.

From a perusal of your editorial it is obvious that you are strangly influenced by the leading article published in the same issue and composed, presumably, by your "recognized investigator" who, according to you, has performed "a distinct service to science" and "has attempted to approach the problem of the influence of colors in biology without prejudice *and with the aim to obtain facts by experimental methods which leave no room for misinterpretation.*" The quotations and grammar are yours; the italics, mine, and for the following reasons. Let us first of all examine the author's self-admitted conditions under which these strange and utterly inconclusive experiments were carried out. Your investigator actually admits that his "filters" merely consisted of pieces of colored cellophane (!) and proceeds to dismiss the entire science of chromotherapy on the results of a series of strange experiments in which the light, on his own admission, was not even monochromatic. The reason given for neglecting this obviously essential factor from his investigations was that it would have made his experiments too complicated and too expensive! To make matters even worse, he seeks to defend this strange economy by stating that monochromasia is unnecessary! The spectral limits of these novel cellophane filters make even stranger reading. The wave-lengths in respect of his so-called red "filter" are given as 565-580 millimicrons (i.e. 5,650-5,800 A.U.), which wave-lengths are entirely confined to the yellow band of the spectrum and, naturally, contain no red whatsoever. The blue filter is given to possess wave-lengths ranging from 500-600 millimicrons (i.e. 5,000-6,000 A.U.) which, if you take the trouble to glance at the chart of the color spectrum, you will see embraces the whole of the yellow and orange, with certain proportions of the green and red on either side, but nowhere near the blue. In the light of these facts, of what avail are his conclusions?

In the review referred to, you ask me for an

explanation of the "supportive action" of red and ultraviolet "light". By this I presume you refer to the combination of red ray or infra-red ray therapy and ultraviolet irradiations. Had you read my book a little more carefully you would have found this fully explained in the text. A little wider reading in ray therapy would have shown you that it is common knowledge today, that infra-red rays are capable of producing an intense hyperaemia, and thus more blood is brought to the area for ultraviolet irradiation. The red rays have been proved to penetrate much more deeply than the infra-red (vide, Bachem, Reed, Levick and others). Surely the conclusions are obvious.

Neither you nor the author of your leading article would appear to have heard of the investigations of A. Bachem and C. I. Reed, published a few years ago in a contemporary and also in your own journal, and it would further appear obvious that you are ignorant of the results of the more recent investigations into color therapy, undertaken by C. E. Iredell of Guy's Hospital, of Murray Levick's successful treatment by red ray therapy of indolent ulcers, which had proved intractable to ordinary classical treatment, and of cases of acute anterior poliomyelitis, previously unsuccessfully treated by general light irradiation and electrotherapy — cases, in which the muscles, prior to red ray therapy, not only showed a reaction of complete degeneration, but with their contractility so far lost as to elicit no response with interrupted galvanic current. Are we really to understand that you seriously contend that such distinguished investigators into chromotherapy are, in your opinion, "charlatans" and "border-line practitioners"?

What object you may have in view and what axe you have found to grind is, of course, your own affair, but if you wish to take any part whatsoever in international medicine you would be well-advised to ascertain the *bona-fides* of foreign investigators before you make your attack upon their itegrity.

I would also, in a purely fraternal spirit, strongly recommend a little wider reading in modern European physiotherapeutics, so that in future you may avoid the risk of being classified among those who

"... Compound for sins they are inclined to,
By damning those they have no mind to".

Let me conclude in the same jocular vein that you adopt in your editorial, with the assurance that you have my permission to publish this communication in its entirety — *if you dare* — but, somehow, I do not think you will do so.

Believe me,
Yours truly,
R. DOUGLAS HOWAT.

Reply

We publish the above letter *verbatim et literatim* not because of the school-boyish "dare" by our correspondent, but because it has always been our editorial policy to adhere to the principle of *audiatur et altera pars* — the other side, too, should be heard. We assume full responsibility for both the book review and the editorial mentioned in Dr. Howat's communication, which ordinarily we would have left without comment were it not for certain imputations which have no justification in fact.

Dr. Howat takes his book too seriously if he concludes that there is a connection between its review and an editorial. It is due to a mere coincidence that the editorial on chromotherapy and his book review appeared in one and the same issue. And how any one can possibly see a connection between them is incomprehensible, since the editorial in question clearly is a satire on the brazen claims made for colored window panes by charlatans in America about whose identity the context can leave no one in doubt. Every sentence in that editorial is living proof that the criticism was directed against a group of men who had not the remotest connection with the ethical medical profession.

We readily admit that the editorial was occasioned by an original article, and while we disclaim any responsibility for any expression by any regular contributor except possibly in the proper selection of contributions, we feel that the standing of the author and the article itself command serious attention. The author under consideration has the same privilege of making deductions from experiments as has our correspondent. Neither this author nor the two authors mentioned in the above letter are at this time subjects of discussion, and it must therefore suffice to call attention to the old truism that one swallow does not make a summer. A remedy may be followed by a cure in an exceptional case without this being acceptable proof of its therapeutic value.

We can afford to ignore our correspondent's implied displeasure with our syntax as well as the personal innuendoes, as we have neither the inclination for claw and fang polemics nor the time to guide our distressed colleague out of the mire of his own strange syllogisms. Suffice it to say that so far as the main issue is concerned, Dr. Howat has little cause for complaint, because if anything the reviewer of his book has suppressed a natural desire for condemnation in harsh terms and has presented a criticism tempered with a charitable feeling for the author's well-meant but misdirected effort. Perhaps even Dr. Howat will admit that the *Journal of the American Medical Association* is to be taken seriously. It so happens that the issue of June 11 contains a review of his book which mirrors precisely the expressions our reviewer has suppressed. Even Sir Henry Gauvain was taken to task for having sponsored the book. Finally, "dare" or no dare, protest or no protest, argumentation or no argumentation, there remains the cold fact that whatever criticisms have been made against the book are impersonal and bona fide on the basis of the intrinsic demerits of the work.

THE EDITOR.

Peripheral Vascular Therapy

To the Editor: Dr. Collens' experimental work deserves great praise for its technical excellence. His elucidation of the physiologic mechanism breaks down, however, when he attempts to explain the mechanical effect of a mechanical treatment by claiming the chemical elaboration of "leukotoxine." Surely a mechanical explanation would be more in

keeping with the purely mechanical nature of intermittent venous compression.

There is a mechanical explanation which depends on two factors: (1) The peripheral vascular bed, made up of arterioles, capillaries, and venules is more important than the large and collateral arteries feeding the bed in that its surface area is tremendously greater than the cross section of the arteries. It is at this point that symptoms of occlusion in the larger vessels develop, although the occlusion is more proximal in location. Treatment must be directed to the increase in the size of the individual arterioles and capillaries of the peripheral vascular bed in order to ameliorate the symptoms of occlusion. Enlarging the large vessels or the smaller collateral branches cannot compare in effectiveness with enlarging the capacity or cross section area of the peripheral vascular bed.

(2) A hydrodynamic law enters now into consideration. "A liquid passing through a tube under pressure exerts pressure against the wall of the tube inversely in proportion to the velocity of the fluid." Lewis' reactive hyperemia effectively increases the velocity of the blood flow and the blood volume to the peripheral vascular bed. The result is improvement in circulation and improvement in the symptoms of vascular disease. Short wave diathermy increases the size of blood vessels and of the peripheral vascular bed with the same result (increased velocity and volume of blood to the part) by causing vasodilatation. In fever therapy or hyperpyrexia it has been noted that the diastolic blood pressure drops to zero because of the tremendous vasodilatation. I therefore treat my hypertension patients with intermittent vascular compression and short wave diathermy with excellent results. Another fallacy to be overcome is the belief that the oscillometer will tell us what the state of closure or patency of the posterior tibial artery or the popliteal or the femoral artery may be. This is not true. The oscillometer only tells how much the cross-section area of the limb at the point measured increases due to the entrance of a pulsation of blood through all the arterial vassels passing through the cross section of the limb at that point.

The central core of the fundamental principle of the treatment, as well as of the diagnosis, of vascular diseases of the extremities is the peripheral vascular bed, not the arterial blood vessels or the collateral circulation. This explanation on a mechanical hydrodynamic basis makes unnecessary the postulation of a more or less mythical leukotoxine. Increased blood supply to the peripheral vascular bed means increased nutrition, oxygenation, pus fighting leukocytes and detoxification. That's enough to explain improvement of vascular occlusive symptoms by intermittent vascular compression and short wave diathermy.

Very truly yours,

J. Wolf Uttal, M.D.,
Peninsula, Ohio.

Comment by Dr. Collens

To the Editor: Dr. Uttal's comments are very interesting. I cannot agree, however, that the use of a physical method of treatment cannot induce other than physical alterations in function. To cite an example, the exposure of the body to ultraviolet rays undoubtedly induces photo-chemical effects, as the synthesis of vitamin D from ergosterol. My presentation of the role of leucotoxine during reactive hyperemia, was of course only a theoretical consideration. I have no positive evidence of it. In principle I agree that the clinical phenomena associated with vascular impairment arise from disturbances in capillary function. That is, of course, where the essential "business of life" goes on. Of what value, however, is the increase in the capillary bed if a sufficient quantity of blood does not enter the capillaries because of interruption in the major pathways? Undoubtedly clinical improvement occurs when more blood has been permitted to enter the capillary bed. I agree with Dr. Uttal on his interpretation of the significance of oscillometric studies.

William S. Collens, M.D.

THE STUDENT'S LIBRARY

THEORETICAL PRINCIPLES OF ROENTGEN THERAPY. Edited by *Ernest A. Pohle*, M.D., Ph.D., F.A.C.R., Professor of Radiology, University of Wisconsin. Foreword by *W. Edward Chamberlain*, B.S., M.D.; Contributors: *R. R. Newell*, M.D.; *Wilhelm K. Stenström*, Ph.D.; *Lauriston S. Taylor*, Ph.D.; *Francis Carter Wood*, M.D. Cloth. Pp. 271 with 132 illustrations. Price, $4.50. Philadelphia: Lea & Febiger, 1938.

The objective of this work is to present universally accepted facts regarding the action and measurements of and protection against roentgen rays of interest to students of radiology. Thirteen years have elapsed from the time of conception of this treatise, but due to certain adventitious contributions, especially the one connected with Behnken's work on the "r" unit, it was thought advisable to not only proceed more slowly with the contemplated plan until a reproducible dosimeter was assured, but also to add to its authoritative background contributors of known standing in radiology. That this has been accomplished is attested by the names associated in this endeavor. Sad to note is the fact that during this interval its chief proponent, Hickey, had died, but the memory of his brilliant and pioneer labors is affixed in the form of a dedicatory note at the beginning of the book. Of the five detailed and comprehensive chapters and complete bibliographies attached to each much in praise could be written. Little more need be said than that each of these has had the benefit of scholarly deliberation by men noted in their own special fields of radiology. The reputation of Stenström on the *Physics of Roentgen Rays;* Newell on *Roentgen Therapy Apparatus;* Taylor on *Dosimetry;* Wood on *Radiology and Radiopathology;* Taylor on *Protection From Roentgen Rays* — all are so highly established that their names are synonymous with the most authoritative expression on the subject. The dogmatic statements by Chamberlain in his foreword may be excused as emanating from an enthusiasm justified by past contributions in radiology rather than his belief in the permanency of the present observed facts. Accordingly Pohle and his associates have added to the better understanding of roentgenology in medicine.

THE PRACTICE OF IONIZATION. By *J. Newton Dyson*, M.R.C.S., and L.R.C.P. (Lond.). With a Foreword by *Elkin P. Cumberbatch*, M.A., B.M. (Oxon), D.R.M.E. (Camb.), F.R.C.P. Cloth. Pp. 178 with 9 illustrations. Price, $1.50. London: Henry Kimpton, 1936.

This small volume presents the theory and practice of galvanic ionization in both a semi-technical and optimistic fashion somewhat reminiscent of yesteryear's empiric practices. Perhaps one of the prime reasons why electro ionization therapy has met with such great resistance by the medical and teaching professions abroad is due to the fact that faith and hope have been combined to form the intermediary link between theory and fact as related to the results claimed for this physical procedure in medicine. Certainly this work exemplifies that no pleas even that of Cumberbatch for a better understanding of physical therapy by the profession will stimulate interest so long as authors will claim cures or even alleviations of such conditions as nerve deafness, tinnitus and the like. The conservative and intelligent student and practitioner will reason that if the clinical part of the book is overcolored by impressionistic evidence, the theoretic portion can be no more reliable. This paradoxically, as it may seem, is not true to fact, because the electrophysiologic discussions have been presented in an understandable and commendable fashion. It is unfortunate that its clinical evaluation was presented by an eye too optimistic to evaluate the special but limited benefits of electroiontophoresis.

THE RELIEF OF PAIN. A Handbook of Modern Analgesia. By *Harold Balme*, M.D. (Durh.) F.R.C.S. (Eng.), D.P.H. (Lond.). Formerly Professor of Surgery and Dean of the School of Medicine, Cheelo University, China. With an Introduction by Sir *E. Farquhar Buzzard*, Bt., K.C.V.O., LL.D. (Man.), M.D. (Oxon.), F.R.C.P., Regius Professor of Medicine, University of Oxford. Cloth. Pp. 392. Price, $4.00. Philadelphia: P. Blakiston's Son & Co., Inc., 1936.

This very informative and practical work conveys such a large fund of clinical nuggets that despite inadvertent delays merits attention. The fact that it deals with a subject as broad as it is old — one that is perhaps the prime motive and dominant symptom that brings the patient to the doctor and calls for remedials to control "pain," is reason for the great interest generally displayed in discourses on this particular subject. While it is true that the problem is many sided, reflecting the need for proper differentiation of causative and pathologic processes, "pain" as a symptom has been a challenge for its relief and has been the mutual concern of physician and patient. Accordingly the author has attempted to draw from a rich experience and those of others, in order to assist the profession in the control of the pain syndrome by all the proven and established methods at our disposal. The work, however, is not intended as a short cut to palliative treatment but rather as a concise exposition of the "pain" problem encountered in daily practice. Divided into four sections, the first attempts to explain the nature, pathways, sensory, physical and psychical directions of pain — its variants, tests and determin

ation. The second part deals with the problem of pain of general and systemic origin wherein this complex symptom is analyzed from its causative sources; namely, whether it is due to inflammatory disorders, or to accrued injuries located in the skeletal, nervous or circulatory system. The third and fourth parts review the pain found regionally all over the body and, finally, the therapeutic resources at our command to circumvent and control this protean symptom. The last section considers the efficacy of rest and posture, baths and packs, movements, massage and electrotherapy, and analgesic drugs. From what has been pointed out it is clear that the author has presented not only a thought provoking work, but also one that provides guidance, suggestions and information of widest value to the profession. The work is enthusiastically recommended as one of the most practical contributions for the prevention and alleviation, together with their dangers and limitations of physical pain.

THE MANAGEMENT OF FRACTURES, DISLOCATIONS, AND SPRAINS. By *John Albert Key*, B.S., M.D., Clinical Professor of Orthopedic Surgery, Washington University School of Medicine, etc., etc.; and *H. Earle Conwell*, M.D., F.A.C.S., Attending Orthopedic Surgeon to the Crippled Children's Hospital, Birmingham, Alabama, Member of Fracture Committee of American College of Surgeons, Advisory Fracture Committee of the American Medicine Association, etc., etc. Second Edition. Cloth. Pp. 1246, with 1222 illustrations. Price, $12.50. St. Louis: C. V. Mosby Company, 1937.

This work offers in detailed form an exposition of the principles, general aspects, diagnosis and treatment of injuries classified as sprains, dislocations and fractures. It represents the point of view of two conservative surgeons who do not hesitate to affirm their own or challenge opinions held by others on any related part of the subject herein discussed. One therefore finds in this treatise an exhaustive but critical evaluation of the practical advances and routine procedures utilized in this important branch of orthopedic practice. Revised and brought down to date, the present edition shows especial and extensive re-writing and additional information on the treatment of fractures of the hip and spine. Indeed, each section and the many chapters show the indices of numerous substitutions and changes throughout the text. Of interest is the fact that the authors have here introduced additional information on methods of diagnosing and treating of fractures which was thought by them to be of value to students and practitioners. As in the first edition, so now: that portion of the text dealing with physical therapy has been written in too cursory and dogmatic a style to provide any satisfactory information of its important role in the traumatic injuries herein so voluminously presented. The intended impression is clearly conveyed that overenthusiasm and ignorance have been the reason for its exploitation rather than critical usage dictated by long experience and universal approval. In this respect it is completely at odds with opinions of highest authority; hence the general sense of the statements regarding the limitations and possibilities of physical therapy are more misinforming than informing and will leave many of its readers so confused as to have them neglect one of the most potent of remedies to the disadvantage of their patients. In contrast to this obvious flaw the work is undoubtedly one of the best contributions on fractures, dislocations and sprains that has emanated from the pen of American surgeons.

DIE VERLETZTE HAND. Behandlung Und Behandlungsergebnisse Der Finger—Und Hand Veletzungen Und— Infektionen (The Injured Hand. Treatment and Treatment Results of Finger and Hand Injuries and Infections). Von Dr. *Karl Krömer*, Assistent des Unfallkrankenhauses in Wien. Cloth. Pp. 294 with 350 illustrations. Price Rm.—27.00. Vienna: Wilhelm Maudrich (American Agency: Chicago Medical Book Co., Chicago, Ill.) 1938.

Owing to dearth of literature especially in monographic form dealing with injuries and infections of the hand and fingers and considering the importance of this type of every-day injuries, the present book is especially timely. The author is a pupil of and assistant to Professor Böhler, who has written an introduction to this monograph. When one considers that in the hospital limited to emergencies under Böhler's personal direction no less than 20,000 cases of the kind treated in the book have been seen during the past decade, and that the average of patients seen daily is never under 350, one must concede that the author had the advantage of an unusual amount of material for observation and study. It is also gratifying that of the 20,000 patients just mentioned only two died, one of sepsis and the other of tetanus.

The book is divided into two parts, the first being devoted to the various methods of treatment and the second to the treatment results. Though neither part is divided into chapters, there are many numbered subdivisions, a well organized table of contents and an excellent index, so that rapid orientation is easy. An idea of the scope of this monograph can be had from the fact that both operative and nonoperative methods of treatment are discussed exhaustively and that considerable space is given to the management of foreign bodies, burns, caustic injuries and in fact every imaginable type of injury, and this entirely apart from the diverse types of infections. The second part dealing with immediate and end results has a similar grouping and is especially informative because it critically reviews the effectiveness of the various therapeutic methods that have been advocated and tried. Poor functional and anatomic results following an injury of a finger or hand of a manual laborer represent not only a tragedy to the individual sufferer but an economic loss to the community. For this reason every surgeon, general practitioner and especially every physician engaged in industrial work should thoroughly familiarize himself with this masterly monograph, which clearly shows the best ways to secure as good results as is humanly possible of attainment.

Science, News, Comments

(*Continued from page 366*)

and were given as careful observation by the dispensary staff as possible. Of this number, only one child died of active tuberculosis while under observation.

This record, Dr. Moorman pointed out, bears out the experience of other physicians who have reported disappointing results of preventorium care and have even recommended its discontinuance.

The object of the preventorium is to give the child enough sleep, food and sunshine so that he can build up resistance to tuberculosis infection and thus avoid the development of active tuberculosis. It is designed for children exposed to continuous contact with tuberculosis in the family or those children already infected with the germs but not yet sick with tuberculosis. The objection to the preventorium is that, besides breaking up the family and being a large expense to the community, its effect is not sufficiently lasting. Whether the child is cared for in a preventorium or at home, ultimate success depends on teaching the child and his family to apply continuously necessary preventive measures. — *Science News Letter.*

11,000,000-Volt Bullets for Use in Attacking Atoms

The production of 11,000,000-volt energy atomic bullets for use in attacking other atoms was announced by Prof. Ernest O. Lawrence, University of California physicist, at the meeting of the National Academy of Sciences meeting in Washington, D. C.

This is the greatest man-controlled energy that Science has had at its command for use in its study of the problem of the constitution of matter.

Already young Prof. Lawrence has transmuted or blown to pieces most of the atoms known to man, using the cyclotron or giant merry-go-round machine gun, which he invented.

To the academicians he also told how he had devised a successful means of bringing beams of high-powered atomic bullets into the clear for purposes of bombarding matter.

The production of the new, high-energy bullets was made possible by substituting the nuclei of helium gas atoms for the hydrogen or heavy hydrogen formerly used. On theoretical grounds it was believed that these helium nuclei would function in the whirligig machine gun, and that because of their mass and double charge they should come out of the apparatus with double the energy previously attained with lighter, less electrically-active bullets.

Experiments have now demonstrated this theory to be correct. Helium nuclei, also known as alpha particles, have been shot out of the machine with an energy of 11,000,000 electron-volts, in a beam of one-tenth micro-ampere.

With this new tool in their hands it is hoped that physicists will be able to make a new attack on the nuclear structure of the atom, and to discover new facts and new transmutation phenomena which so far have not even been thought about.

Along with this development, Prof. Lawrence announced changes in his cyclotron apparatus which make it possible to send a stream of high energy bullets clear of the machine. In the laboratory such beams have been shot into the air for a distance of twenty-five centimeters, and with evacuated tubes this distance can be greatly increased. The importance of this accomplishment is in adding facility to experimentation with the powerful beams produced.

With the present status of the cyclotron apparatus, greater scope will be given to biological experiments on the effect of neutron rays upon living tissue. Preliminary studies have indicated that the neutron ray may be even more valuable in certain types of medical therapy than is the x-ray.

Transmutation of platinum, one of the noblest metals of the universe, and the creation of two elements new to science, radio-platinum and radio-iridium, was also reported by Prof. Lawrence.

As projectiles in the transmuting bombardment, Prof. Lawrence and his cooperating colleague, Dr. J. M. Cork, utilized the cores of heavy hydrogen atoms, deuterons to chemists and physicists. Thus they made previously unknown varieties of matter through the use of a kind of atom, known as heavy hydrogen or deuterium, which was discovered as recently as 1931.

The giant whirligig atom gun, with its 85-ton magnet, produced the 5,000,000-volt deuterons used. The virtue of Prof. Lawrence's famous apparatus, now copied in a score of other laboratories throughout the world, is that relatively low vltages are built up by series of mild electrical pushes into the extremely high voltages used.

The new radioactive element varieties, called isotopes, were separated chemically from the platinum that was unchanged.

Prof. Lawrence told the academicians just what happened when the transmutation took place.. When radio-iridium is created, a deuteron is captured by the core or nucleus of a platinum atom and an alpha particle, which is a helium atom core, is violently ejected. Radio-platinum was synthesized by a process that amounted to the capture of a fundamental building block of matter that is known as the neutron. And radio-platinum disintegrates into gold. — *Science News Letter.*

INTERNATIONAL ABSTRACTS

Experiences in Five Years' Treatment With Ultrashort Waves and Short Waves, in Particular With Abdominal Affections. (Fünfjährige Erfahrungen mit Ultrakurzwellen — und Kurswellenbehandlung besonders bei Unterleibskrankheiten). C. Vaernet.

Deutsche med. Wchnschr. **63**:1224 (Aug. 6) 1937.

The following report deals with observations extending over four years in the treatment of abdomino-pelvic diseases with short waves. Vaernet analyses his clinical results obtained in a total of 381 patients, 193 of which were classified as chronic in character, 71 diagnosed as actively acute salpingo-parametritis, 103 as those suffering from molimina menstrualia, and 5 associated with painful adhesions that were marked for early operation. The group also included 9 patients with persistent neuralgia, all having had prior treatments of a routine nature. Nearly all of these patients were treated in the out-patient department, many of whom even having carried a slight temperature at the time treatment was started. With the acute cases short wave therapy was initiated regardless of the temperature but these were treated with care and caution. It was observed that the general condition of the patient improved soon after the beginning of treatment, and that menstruation beame more regular and less painful. In the presence of large or extensive discharging areas, treatment was of small effect. Cases which revealed large exsudations posterior to the uterus also showed unfavorable reactions. Eleven patients who had been childless from 3-8 years, had normal children within two years following the treatment. Results with molimina menstrualia and neuralgia were very satisfactory. Treatment of adhesions showed no more satisfactory result whether short wave or other methods were employed.

Efficient Treatment of Purulent Ophthalmia by Means of Steam-Spray Hyperthermy. (Zur wirksamen Behandlung der Ophthalmoblenorrhöe durch Anwendung der Dampf-Spray Hyperthermie). J. Brecher.

Klin. Monatsbl. f. Augenh. **99**:301 (Sept.) 1937.

In purulent ophthalmia the steam-spray method at a 10-12 centimeters distance from the eye is advocated by the author as the most convenient source of local heat application. A maximum temperature of 42 degrees C. is thereby attained sufficient to speedily destroy the gonococci or to exterminate their virulence. The method does not in any way injure the eye tissue. One can improvise such an apparatus by fixing a thin elastic drainage tube to the mouth of an electric tea pot, the lid of which must be tightly fitted. Preliminarily to the steam application, the eye must be washed in the usual manner with potassium permanganate. By a preliminary instillation of a 10 times diluted solution of adrenalin (1 per mill) a marked vasoconstriction of the conjuctiva vessels was produced. Steam therapy brings about pain-relieving and eutrophic effects in conditions of corneal affection. By simultaneous brushing with biotropic disinfectants (the author applies argolaval eye ointment for which the steam secures a better distribution), all pharmacodynamic and physical curative effects are intensified.

Results of Pyretotherapy at Vanderbilt University Hospital. Robert H. Williams.

South. M. J. **30**:1080 (Nov.) 1937

During the course of treatment Williams encountered the common, mild treatment reactions. These were nausea, vomiting, facial herpes, headache and superficial skin burns. Tetany rarely occurred. In addition, one patient developed during the febrile period transient circulatory collapse; one, transient respiratory paralysis; one, cerebral thrombosis with hemiplegia; one, presumably died of ventricular fibrillation. The patient with hemiplegia experienced slow but steady improvement and in two months following this episode was capable of returning to his work as a laborer.

During the past year artificially induced fever has been employed as a therapeutic measure at the Vanderbilt University Hospital. Excellent results were obtained with the Kettering hypertherm in the treatment of twenty-seven patients with gonorrhea and its complications. Distinctly encouraging results were obtained in the treatment of eight patients with syphilis of the central nervous system. Four patients with rheumatoid arthritis experienced only temporary improvement. One patient with chorea and rheumatic carditis obtained an excellent therapeutic result. One patient with sarcoidosis received inadequate treatment without significant benefit. Serious treatment reactions have been encountered, but are infrequent.

The Present Status of Artificial Fever Therapy in Medico-Military Practice. E. H. Parsons; Joel J. White; Robert M. Hardaway, Alice Barnes.

Mil. Surgeon, **81**:258 (Oct.) 1937.

The authors have observed apparently excellent results with pyretotherapy in gonorrhea and syphilis beyond the scope of other therapeutic measures. They have previously reported a marked reduction in the time lost from gonorrhea

in cases treated with this method. More recently they have been able to treat some cases of gonorrhea and return them to full duty apparently well in less than 10 per cent of the time usually lost with this disease. They will report this data later when further studies have been completed. Since these diseases account for such a large proportion of military man-days loss each year, artificial fever therapy is a most promising adjunct to medico-military therapeutics. At this time, however, artificial fever therapy must be considered in its development stage, still a problem in research, not yet ready for general use.

Modern Fever Therapy in Syphilis and Gonorrhea. Adolph Jacoby.

J. Soc. Hyg. **23**:253 (May) 1937.

The results reported by various observers indicate that from 70.5 per cent to 93 per cent of individuals subjected to this treatment are cured. The value of fever treatment lies chiefly in the rapidity of cures. Although the method is effective it is not without danger to the individual treated. The patient is completely exhausted as the result of the treatment and unless the utmost precautions are continuously taken during and after the treatment, death may result. In spite of the efficiency of the treatment and the more rapid cures brought about, it is as yet not a practical method of treatment inasmuch as during the past five or six years in which the passive fever treatment has been used probably not more than 2,000 patients have been so treated. It is exclusively a hospital procedure to be carried out only by specially trained medical and nursing personnel. In consideration of the vast numbers of individuals affected with gonorrhea, and the limitation of existing facilities, it is at the present moment impossible to apply the treatment to any considerable portion of infected individuals. It should be regarded as still in the experimental stages and reserved for those cases in which the established methods of treatment have failed. With improvement in instruments and technique the method may become safer and available to a much greater extent than is now possible and so make applicable this type of therapy to a much larger group.

Influence of Short Wave Irradiation On Bacteria. T. Ozzano, and C. Re.

Gior. di batteriol. e immunol. **19**:535 (Oct.) 1937.

Ozzano and Re prepared two series of tubes which contained suspensions of several species of pathogenic bacteria. The tubes for the experiment were submitted to irradiations with waves 4.3 and 7.36 meters for thirty minutes. The controls were left in the incubator at a constant temperature of 98.6 degrees F. Immediately after the irradiation smear cultures were made with the experimental and control suspensions. After the preparation of smear cultures the experimental and control tubes were left in the incubator and the experiment was repeated one, four, six, twelve, and fifteen hours after the first irradiation. The results as to the development and changes in the morphology and biologic properties of bacteria were observed in the smear culture suspensions twenty-four or thirty-six hours after they were prepared. In general, they were the same for the two bacterial suspensions. The irradiations sometimes stimulated and sometimes inhibited the development of bacteria. The effect was transient because of the extraordinary capacity of bacteria to regenerate. According to the authors, short wave irradiations have no selective specific action on bacteria. They act in an abiotic way by increasing the temperature of the environment of bacteria. — [Abst. J. A. M. A. **110**:244 (Jan. 15) 1938.]

Value of Ionization In Nose, Throat and Ear Conditions. Philip S. Stout.

Med. World **56**:36 (Jan.) 1938.

This report deals with the effect of conization limited to otolaryngologic conditions. Stout reports startling and prompt relief in 100 cases following zinc ionization in non-complicated conditions. In the presence of bone necrosis, cholestema, there are evidences of bone necrosis, cholesteatoma, postoperative mastoid (usually following a radical mastoid operation) with chronic purulent discharge, these and marked granulation tissue in the external canal do not as a rule respond to ionization and should be treated in a different manner. But then, many chronic discharging ears that for some reason or other will not dry up, treat them as you will, often respond to ionization treatment.

From these experiences the author concluded that ionization should be tied in chronic discharging ears before more radical steps are attempted, unless there is definite reason for the radical proce dures. Eight out of ten of the chronic ears will become dry after treatment and remain dry indefinitely in most cases. In some instances ionization is helpful in eczema and itching of the external canal of the ear. It was found beneficial in hay fever — 80 per cent relief. In hypersensitive rhinitis (not hay fever) the results are very gratifying. In some cases, ionization of nasal mucous membrane gives relief in mild asthma, and in chronic paranasal sinusitis.

On Lymphogranulomatosis (Ueber Lymphogranulomatose). H. U. Gloor.

Deutsche med. Wchnschr. **63**:1696 (Nov. 5) 1937.

Considerable progress was made of late in radiotherapy of lymphogranulomatosis. The approximate length of life of these patients is about 2 to 3 years. It may be prolonged to 4 to 5 years in cases where radiation is given at an early stage. Success of radiation depends on an early diagnosis, regular treatment, continuous control and observation of the clinical picture. This explains the reason for the beneficial effects obtained in cervical lymphogranulomatosis and indifferent results in the abdominal type. Best of

all reactions has been associated with isolated foci. Serious erosions of bones within the range of the vertebral column may grow firm when exposed to radiation. The author is against prophylactic radiation in cases where diagnosis is in doubt with reference to the effected area. In the presence of acute reaction or in progressive anaemia or diminution in number of white corpuscles, treatment must be definitely terminated. Arsenic treatment, transfusion of blood and—at times—liver therapy may be of use during these intervals.

After-Effects From X-Ray Therapy, Their Characteristic Features, and Respective Treatment (Der Röntgenkater, sein Wesen und seine Behandlung). W. D. Germer.

Med. Welt. **11**:1642 (Nov. 20) 1937.

After-effects from x-ray treatment are supposed to be due to an influence exercised on the visceral nervous system. As a matter of fact these symptoms equal those of vagotonia. Accordingly an attempt was made to relieve the symptoms by means of depressing the vagus on the one hand and stimulating the sympathetic nerve on the other. Remedies were used, as cardiafol, ephedrine, sympathol, ephetonin, nautisan, from which only inconsistent results were obtained. The hyperglycaemia and the increased lactic acid following treatment, suggested the use of insulin therapy for the after-effects of x-rays. This method is commended by various people. The definite but temporary decline of the cholesterol of the blood following irradiation is a significant after-effect and must be controlled by protection of the suprarenal capsule because of its importance in cholesterine metabolism. To raise the level of cholesterine Germer administered hepatrate, an extract of liver that has a stimulating and protective influence on the blood. Dosage: In mild cases it is injected intramuscularly to a depth of 1 to 2 ccm. In severe symptoms it is injected at a depth of 5 ccm.

Short Wave Irradiation in Treatment of Inflammation. E. V. Salerno.

Prensa méd. argent. **23**:2563 (Nov. 11) 1936.

Salerno reports satisfactory results from short wave irradiations in the treatment of several processes of chronic, subacute and acute inflammation as well as in certain diseases with angiospasms or viscerospasms of the smooth muscles. The number of irradiations varied from seven to ten given daily or every other day for a duration of from ten to forty minutes. Short waves constitute the best physical therapeutic agent against inflammation.

Finsen Lamp in Treatment of Lupus Vulgaris of Skin. S. Lomholt.

Ugesk. f. laeger **99**:1250 (Nov. 25) 1937.

According to Lomholt's experience, centralization of the Finsen treatment of this disease with the direction in the hands of fully trained specialists in the various fields of the treatment is called for. He emphasizes the excellent results attained both curatively and cosmetically under these conditions. He stresses that the chance of successful results is lessened when other forms of treatment have preceded, and that cure can hardly be expected in cases in which eruptions have been neglected for from ten to forty years. — [J. A. M. A. **110**:476 (Feb. 5) 1938.]

X-Rays Used in Cosmetics (Die Röntgenstrahlen im Dienste der Kosmetik). J. Borak.

Wien. klin. Wchnschr. **50**:1559 (Nov. 12) 1937.

There is a close relationship between the problem of x-ray therapy in cosmetics and the question of radio-tolerance of tissues. Investigations concerning radio-tolerance have been promoted by building exact dosimeters, and by knowledge of the fact that the skin will tolerate soft filtered rays better than hard ones filtered through heavy metals. In addition to that the theory of radio cumulation has been altered so far by Regaud's and Coutard's conception of different intensity of cumulation in the different tissues. Uniform cell tissue structures show worse cumulation than tissues composed of several layers of cells. Among the uniform tissues composed of one layer of cell we may point out the endothelium of vessels and others; among the multiform tissues, composed of several layers the epiderm, hair and sebaceous glands may be mentioned. The fact of different intensity of cumulation in the tissues is of great importance for the total dosage as well as for the amount of separate doses. Consequently in treating cosmetic affections only small separate doses must be applied in order to preserve the vessels.

So far as treatment of hypertrichosis, a permanent epilation, will require a larger dosage as compared to the one used in removal of male hair. Thin lanugo hair is less radio-sensitive than thick terminal hair. Marginal hair at the angle of the mouth is less radio-sensitive than central hair. X-ray treatment of hypertrichosis is still a disputed problem; only suitable cases should be submitted to that form of therapy. Daily applications of small dosage are recommended. Previous to each exposure, and for the purpose of avoiding any injuries, the oral mucous membrane should be painted with a solution of adrenaline. In that way — according to Schwarz — bloodlessness of the tissues is being produced, hence radio-sensitivity is considerably abated.

Treatment of Erysipelas (Die Behandlung des Erysipels). H. Bode.

Ztschr. f. ärztl. Fort. **34**:587 (Oct.) 1937.

Radiotherapy plays an important rôle among the measures for local application in erysipelas. It may be carried out with super alpine ultraviolet lamp or x-rays. With the first method it is mainly a matter of causing intensive reactions (of the 2nd degree, if possible). Ultraviolet radiation has stood the test extremely well in erysipelas of infants. The exposures should be

managed in such a way as to slightly overlap the healthy skin. One should attempt to produce, following the first treatment, a marked bullous reaction. Very beneficial results are also obtainable by x-rays. The dosage most frequently used, averages between 50 to 120 r with soft and medium hard rays, which also includes the surrounding portions. If prompt relief is not seen after the first exposure (as in most of cases it does) we may apply the same dosage one or two more times within the next few days. Of late small doses of about 50 r were suggested, using large fields and soft rays.

Principles Concerning Radioactive Treatment of Carcinoma Labium Vocale (Grundsätzliche Fragen zur Radiumbehandlung des Stimmlippenkarzinoms). A. Herrmann.

Hals-, Nasen- u. Ohrenarzt. (Teil 1) **28**:273 (July) 1937.

Radioactive therapy of carcinoma labium vocale by way of fenestration of the thyroid cartilage was initiated by the author at the Giessen Clinic in 1929. In order to avoid risk of cartilage necrosis, entire removal of the thyroid cartilage at the diseased side was performed, followed by radium for several days. Small quantities of radium were utilized, never exceeding a period of 1300 to 1400 mg. hr. Strictest attention was paid to asepsis in both introducing and removing the radium. There were 10 successful cases reported. Calcium was always administered to the patients previous to the radioactive treatment and while it was going on, as a prophylactic against oedema of larynx. In answer to the question as to whether better to operate on carcinoma labium vocale or radioactive treatment, the author advocates radioactive treatment by principle if (1) carcinoma is merely limited to the labium vocale, (2) it is unilateral, (3) no metastatic formations of glands are present, (4) the tenoid cartilage is not fixed. In consequence of those points of view radioactive therapy is preferable to operative opening of larynx and to x-ray treatment.

Effects of Subaquatic Therapy Worked by Jets of Water on Ulcers of Thigh, Cicatrised Ulcers and Bed-Sore (Die Wirkung der subaqualen Wasserstrahlentherapie beim Ulcus cruris, Narbenulcus und Decubitus). K. Horsch.

Balneologe **4**:512 (Nov.) 1937.

The author reports of a bloodless method of treating ulcers. By using a maximum active dose we may make the diseased area become hyperaemic. This is to be managed in the following way: For a period of 10 to 15 minutes a jet of multiple atmospheric pressure is administered in centrifugal direction to the popliteal space, skirting the popliteal artery, alternately with circular jet-douche massage of the diseased area and of centripetal massage of the saphenous region. By that procedure, by way of development of arterial hyperaemia new blood is being pressed into the diseased area. By simultaneous heavy pressure on the oedematous region the sediments of metabolism massed in here, are drained into the appertaining venous blood vessels. The temperature of the jet of water is of no importance. The author chose a temperature of 40 to 60 C., the intervals of applications being 1 to 2 days. Ointment of cod liver oil employed as a local supplementary treatment turned out very well, so owing to its high vitamine contents it worked as an adjuvant to granulation. In the matter of developing hyperaemia, however, the ointment is of secondary importance.

Treatment of Lupus (Ueber Lupusbehandlung). G. Stuempke.

Ztschr. Ärztl. Fort. **34**:489 (Sept.) 1937.

In the general treatment we have to consider 3 points: (1) diathermy, (2) medication, (3) ultraviolet light. By no means in all of the cases — nor solely — good service is rendered by a diet poor in common salt. Medication (cod liver oil, gold preparations, arsenic) is not altogether satisfactory. Light therapy is meant for total irradiation. General radiation, in particular of some length of time, is not tolerated by all patients. To those belong such patients who suffer from tuberculosis of another organ; they should be given partial irradiation merely. If total radiation is applied the initial doses must be small (1, 2, 3 minutes), to be augmented to some hours. The patients may be partly in recumbent position, partly moving about while the treatment is going on. Being in motion they offer a better chance for the circulation of blood in the skin.

As far as local treatment is concerned, the author advocates the Kromayer quartz lamp still to be taken into account, owing to its outstanding effectiveness at times, as a result of increased action by compression of the skin. A therapy of carbon dioxide snow may be employed in cases of very small infiltrations. Applying the diathermic coil to the face should be avoided, the range of indication of the coil embracing larger foci at the trunk and at the limbs. Radium applications are recommended chiefly with foci of the face not requiring very careful management of the tissue, f. i., at the nose, ears and eyes, further as an after-treatment of residual infiltrations, left over from treatments by means of the Kromayer quartz lamp or of carbon dioxide snow. Grenz rays — in the author's opinion — are indicated for lupus of marked cicatricial changes, when there is hardly a question of removing circumscribed nodules, imbedded in scars by means of carbon dioxide snow, diathermic coil and quartz lamp. Grenz-rays are also indicated for very persistent cases of lupus at the face or as after-treatment when other methods failed. We must comply with reactions happening now and then, which even may turn out favorably. No other treatment should be administered as long as the grenz rays are being applied.